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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CLXIX.] FEBRUARY, 1880. [PRICE FOURPENCE. or 5s. per ann. post free.

## METEOROLOGY IN PORTUGAL.

Señor Capello has done us the honour of sending full particulars respecting several of the points raised in the article in our December number. We are glad to find that in nearly every respect the explanations are perfectly satisfactory. Instead of translating the whole of Señor Capello's letter, we will take the various subjects in the order in which they follow in the article above-mentioned:—

"*A recording rain gauge of which we should be glad to receive a description.*"

This, with an engraving, will appear in *British Rainfall*, 1879.

"*We do not see mention of any thermometers for observing the temperature of the earth at different depths.*"

Señor Capello sends us the following welcome information:—"Since January, 1879, we have observations daily at 9 a.m. of five of Becquerel's electric thermometers at the following depths:—

| | | | | | |
|---|---|---|---|---|---|
| Metres ..... | ·05 | ·3 | ·7 | 1·1 | 1·5 |
| Inches ..... | 2 | 12 | 28 | 43 | 59 |

With the exception of a little trouble with the galvanometer on very damp days, the observations are easily made, and they can be repeated every 15 or 20 minutes if desired.

These thermometers have given the following results for 1879:—

| Depth in Metres ..... | ·05 | ·3 | ·7 | 1·1 | 1·5 |
|---|---|---|---|---|---|
| Maximum Temperature... | 75°·2 | 78°·4 | 76°·5 | 74°·5 | 72°·5 |
| Date ..... | Aug. 30. | Aug. 31. | Sept. 4. | Sept. 5. | Sept. 8. |
| Minimum Temperature ... | 44°·2 | 50°·5 | 53°·6 | 55°·4 | 56°·7 |
| Date ..... | Feb. 27. | Feb. 28. | Mar. 3. | Mar. 7. | Mar. 12. |
| Mean Temperature..... | 59°·7 | 64°·4 | 64°·9 | 64°·9 | 64°·6 |
| Range of Temperature ... | 31°·0 | 27°·9 | 22°·9 | 19°·1 | 15°·8 |

Since the 1st of January, 1880, we are taking direct observations of five thermometers at the same depths, but on Lamont's system, as advocated in the *Meteorological Magazine* for January, 1876, but the tubes are of lead; up to the present time the results are sufficiently in agreement with those from the electrical thermometers.

Moreover, we have two of Becquerel's electrical thermometers buried 5 metres (16½ ft.) and 10 metres (33 ft.) in a bed of clay, but these are designed rather for determining the rate of penetration of heat than for agricultural purposes.

"*The mean of the max. and min. at Campo Maior gives* 62°·3, *but a correction varying from* 0°·5 *to* 1°·3 *has been applied for some reason not stated.*"

At Campo Maior observations are made at 9 p.m. as well as at 9 a.m., noon, and 3 p.m., and for that station the mean temperatures are deduced from

$$\frac{\text{Max.} + \text{Min.} + 9 + 9}{4}$$

which is more exact.

"*There is an error of 6mm. either in the month of Dec., Jan., or Feb.*"

Yes. The fall for February, 51·9 mm. in the original, was misprinted 57·9. In the *Met. Mag.*, therefore, on page 171, under Campo Maior, February should be 2·04 and the total 21·78 in.

"*There are now two rain gauges at the observatory—one which was erected about* 20 *years since, on the top of the observatory,* 75 *ft. above the ground, and the other* 5 *ft. above the ground; but they collect nearly identical amounts. This is such an unusual fact that we should be glad to know whether the lower gauge is quite fully exposed.*"

Señor Capello makes the following interesting remarks :—

"On the central tower of the observatory we have four rain gauges placed nearly at the cardinal points N., E., S., W.; those at the N. and S. are on Babinet's pattern, 0·01$^{m2}$ (4·43 in. diam.), for direct observation; dependent upon the direction and force of the wind, these two gauges never agree, that on the windward side always collects least: we take the mean of the two.

"The lower gauge is 5 ft. above the ground, quite open, and far from the influence of trees and buildings.

"When the wind is light or calm, all four of the upper gauges and the lower one nearly agree; but if the wind is moderate or strong, there is a great difference between the upper gauge on the windward side and the lower one. This difference is, however, much lessened by taking the mean of the two upper gauges. My own opinion is that the differences between upper and lower rain gauges is solely dependent upon the direction and force of the wind.

"The two gauges at the E. and W. of the tower are of five times the area of those of Babinet (9·92 inches diameter), and the rainfall is recorded automatically in the room below."

## REVIEW.

*Comment on observe Les Nuages pour prévoir le Temps, par* ANDRE POEY. *Troisième Edition.* Paris: Gauthier-Villars. 8vo. vi.–172 pages, 3 figures, and xvii. chromo-lithographic plates.

To those who know Prof. Poëy chiefly for his labours in Meteorological Bibliography, it will undoubtedly appear rather droll for us to commence our notice of this excellent book by charging him with an offence against the rules of Bibliography. The title page states that this is the third edition of "How to observe the Clouds," whereas that title is as new as it is happy. The facts, we believe, are that

Prof. Poëy first suggested his new classification of clouds at a meeting of the Académie des Sciences at Paris in 1863; a fuller paper, read before the Meteorological Society of France, was translated into Spanish and published in Mexico, then developed and printed in English in two or three publications in the United States. The most important and, indeed, world-wide circulation being that of the reprint in the Report of the Smithsonian Institution for 1870 (total issue upwards of 13,000 copies), where it appeared under the title of "*New Classification of Clouds.*" Two years after it was further developed, and published in the *Annales Hydrographiques* with the same title, "*Nouvelle Classification des Nuages,*" and now it appears again with a title entirely different. Has Prof. Poëy no pity for the unfortunate bibliophile of the 21st century, who tries to find copies of the first and second editions of "Comment on observe les Nuages"? Apart, however, from the confusion which the new title may occasion to some very few individuals, we think that the old one gives the more accurate idea of the contents of the work.

We suppose that the number of copies printed of the *Annuaire Météorologique* of Lamarck must have been extremely small, for very few perfect sets are to be found, and it is, we suppose, to this cause that must be attributed the general ignorance of the fact that Lamarck suggested a classification of clouds a year or so before our own Howard read his paper before the Askesian Society in the winter of 1802–3. We are sure, however, that had Poëy known Howard personally, he would have given a rather different turn to the phrase at the top of page 5 of the work before us.

It would be presumptuous for us to pronounce an *ex cathedrâ* opinion as to the extent to which the alterations suggested by Prof. Poëy will be adopted; in the present work he gives the opinions formed after many years of study in various regions of the globe, and he is doubtless quite ready to follow up the proposals which he has submitted. It is quite impossible for us to discuss every point raised in this interesting work, and it will be far better for our readers to study it for themselves.

We own to a little dread lest, while trying to improve upon Luke Howard's nomenclature, confusion instead of improvement may result, and we venture to suggest that while it is most desirable to thoroughly *discuss* the subject, it is not expedient to *adopt* any new nomenclature until it has been stamped with the approval of an International Conference. Neither Lamarck nor Howard was superhuman, and it would therefore have been extremely remarkable had either of them devised a perfect system.

Poëy himself does not recommend the same nomenclature as he did in 1869, and we see that the Rev. W. Clement Ley, in a long and able article in *Nature* for Jan. 1st, 1880, recommends another, which is in fact a compromise between the nomenclatures of Howard and of Poëy; and some such combination is, we suspect, very likely to be finally adopted.

We are not so much enchanted with the plates as Prof. Poëy appears to be; they seem to us too hard in all their outlines, and in that respect far inferior to those which Prof. Poëy truly describes as "les belles gravures des cinq Planches de Schübler."* But that is quite a minor point in a work which has many excellencies. We know of no other which gives anything approaching to a history of cloud nomenclature; while for its details of cloud structure, and for the completeness of its bibliographical references, it is unequalled.

## REMARKS ON SOME POINTS IN PROF. POËY'S "COMMENT ON OBSERVE LES NUAGES."

*To the Editor of the Meteorological Magazine.*

SIR,—Your readers may make acquaintance with the third edition of Prof. Poëy's work on the clouds; in this case, the remarks I now offer will, I hope, assist to a clearer understanding of some of the questions raised in that work.

Prof. Poëy understands the stratus of Howard, and points out the mistakes into which meteorologists have fallen, through not keeping in sight Howard's definition. His objections to this one of Howard's modifications are based on the difference of a cloud and a fog, which he endeavours to define. Prof. Huxley is much more happy in his definition—"A fog is a cloud resting on the earth; a cloud is a fog floating high in the air" (Physiography, fol. 45).

I now turn to cirro-stratus. Here Prof. Poëy is himself somewhat in error, this cloud not being, as he supposes, always higher than cirro-cumulus; such, indeed, is less usually the case. Plates v. and vi., marked "Cirro-stratus, Howard," do not profess to be all representations of this cloud. I consider, as far as can be gathered from the plates and descriptions, since the lithographs are not delicate enough to show "structure," that in plate v., figures 1, 3, and 6 are cirri; figure 2, a tiny cirro-cumulus; figure 7, the cirro-stratus of the higher region—the pallio-cirrus of Prof. Poëy; figures 4 and 5, plate v. and plate vi., all appear to me to be cirrus becoming cirro-stratus. Plate iii., figure 1, is called cirro-stratus (fol. 53); it is cirrus. In plate xi., figure 3, a sheet cirro-stratus is represented; the upper pallium, plate xii., figure 1, is clearly sheet cirro-stratus. In "Instructions in the use of Meteorological Instruments, 1877," cirro-stratus, chiefly that of mid region, is correctly drawn.

Cumulus and cumulo-stratus are considered by Prof. Poëy to be identical. The commencement of the formation of cumulus-stratus may be found in "Instructions in the use of Meteorological Instruments"; it is only needful to refer to this to understand the difference between the cumulus and the cloud formed by the inosculation with it of the cirro-stratus of mid region.

The central point in Luke Howard's definition of Nimbus is, that

* *Schübler, Dr. G. Grundsätze der Meteorologie. Neu bearbeitet von* Dr. G. A. Jahn. 8vo. Leipzig, 1849.

rain must be falling from the cloud, or system of clouds, at some point or other.

The descriptions of fracto-cumulus leave much to be desired. At page 108, I read, "Fracto-cumulus sont des fragments de Cumulus, etc.," at page 110, paragraph 2, and in plate xiii., I find it as cirro-stratus about to inosculate with cumulus; in the index, fol. ii., I meet with "Seuls, le Cirro-cumulus et le Fracto-cumulus s'étendent en couches."

It is a pleasure to meet with the third edition of a work on the clouds; when it reaches a fourth, the pleasure would be enhanced if the mistakes which the work at present contains had disappeared.

W. DILLWORTH HOWARD.

*Tottenham.*

## COLD PERIODS.

*To the Editor of the Meteorological Magazine.*

SIR,—The year that we have just done with, among so many strange meteorological phenomena, affords the singular one of two distinct hard winters—one at each end of the year. During 30 years' observation we have only had three winters, until this year, with 28 continuous cold days and a daily average considerably below freezing. They are as follows:—

| | | | | |
|---|---|---|---|---|
| 1855 | ..... | 28 days | ..... | Mean temp. 27° |
| 1860-1 | ..... | ,, | ..... | ,, ,, 25° |
| 1870-1 | ..... | ,, | ..... | ,, ,, 27½° |
| 1879 (Jan.) | ..... | ,, | ..... | ,, ,, 28½° |
| 1879 (Dec.) | ..... | ,, | ..... | ,, ,, 28° |

Moreover, the cold of last January succeeded three weeks' severe frost in December.

We have only twice had a lower minimum than last December, viz., 8°; once in Dec., 1860, when it was 2°, and in Feb., 1855, when it was zero.

Does not the drought we have entered upon and the high barometer—highest since 1873—point to a change for finer seasons? Let us hope so.—Yours truly,

W. LUCAS,

*Hitchen, 4th Jan.*, 1880.

## WHICH IS THE BEST THERMOMETER SCALE?

*To the Editor of the Meteorological Magazine.*

SIR,—No sooner does a frost take place than there arises the old difficulty as to understanding what people mean when they speak of so many degrees, for they will not confine themselves to speaking of the temperature as it stands marked on the thermometer scale, but talk also of so many degrees of frost, thereby putting everything into confusion, mixing up freezing point with zero till one is at a loss to know whether 5° represents 5° below freezing, *i.e.*, 27°, or 5° below zero, *i.e.*, —5°, or 37° of frost, or 5° above zero, *i.e.*, 5°, or 27° of frost. I do not mean to say that meteorologists would make this mistake, for I believe it is agreed by them all to speak only of

temperatures as they stand marked on the themometer scale, but the outside public make this mistake every day, and will continue to make it till freezing point is assimilated with zero; so surely it would be better if we could unite together and make up our minds once for all to use some scale that would be as easily understood by the outside public as by ourselves.

The difficulty would be what scale we could use if we discarded Fahrenheit. We should have to select from a number of rival ones, each with perhaps something in its favour, and pick out from these the one which was the best and most suitable for both meteorologists and others. Let us, then, take those which are now chiefly in use, and any others that might be suitable, and compare together. We will place them side by side, and then discuss the merits and demerits of each.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| Fahrenheit. | Centigrade. | Réaumer. | Zero Fahrenheit. | Fifty Fahrenheit. | Hundred Fahrenheit. | Fifty Centigrade. | Hundred Centigrade. | Zero Bi-Centigrade. | Hundred Bi-Centigrade. | Pyramid. |
| ° | ° | ° | ° | ° | °. | ° | ° | ° | ° | ° |
| *212 | 100 | 80 | 180 | 230 | 280 | 150 | 200 | 200 | 300 | 250* |
| 194 | 90 | 72 | 162 | 212 | 262 | 140 | 190 | 180 | 280 | 225 |
| 176 | 80 | 64 | 144 | 194 | 244 | 130 | 180 | 160 | 260 | 200 |
| 158 | 70 | 56 | 126 | 176 | 226 | 120 | 170 | 140 | 240 | 175 |
| 140 | 60 | 48 | 108 | 158 | 208 | 110 | 160 | 120 | 220 | 150 |
| 122 | 50 | 40 | 90 | 140 | 190 | 100 | 150 | 100 | 200 | 125 |
| 104 | 40 | 32 | 72 | 122 | 172 | 90 | 140 | 80 | 180 | 100 |
| 86 | 30 | 24 | 54 | 104 | 154 | 80 | 130 | 60 | 160 | 75 |
| 68 | 20 | 16 | 36 | 86 | 136 | 70 | 120 | 40 | 140 | 50 |
| 50 | 10 | 8 | 18 | 68 | 118 | 60 | 110 | 20 | 120 | 25 |
| † 39·2 | 4 | 3·2 | 7·2 | 57·2 | 107·2 | 54 | 104 | 8 | 108 | 10† |
| ‡ 32 | 0 | 0 | 0 | 50 | 100 | 50 | 100 | 0 | 100 | 0‡ |
| 14 | —10 | — 8 | —18 | 32 | 82 | 40 | 90 | —20 | 80 | —25 |
| ‖ 0 | —17·8 | —14·2 | —32 | 18 | 68 | 32·2 | 82·2 | —35·6 | 64·4 | —44·4‖ |
| —4 | —20 | —16 | —36 | 14 | 64 | 30 | 80 | —40 | 60 | —50 |

* Water boils. † Water densest. ‡ Water freezes. ‖ Fahrenheit's Zero.

In the above list are eleven different scales, which we will now examine. The first on the list, or No. 1, is Fahrenheit, chiefly in use in Great Britian and her colonies, and in the United States; No. 2 is Centigrade, used mostly in France and Germany; while No. 3 is Réaumer, used principally in Russia. The advantage of either of the two latter over the former is that their zero is at freezing point, while Centigrade has the further advantage of an even 100 degrees between boiling and freezing points. On the other hand, Fahrenheit has the advantage of much smaller degrees, and in having the zero point 32° below freezing you escape the difficulty of a quantity of plus and minus signs in adding up the temperature columns, except in exceedingly rare instances. This, in fact, is the one great disadvantage of fixing zero at freezing point, while its advantage consists in

seeing at a glance which are frosts and which are not, also how intense the frost is, and it is easily understood by the outside public, while the other is not, which to my mind more than counterbalances its disadvantage. The fourth scale on the list I have called Zero Fahrenheit. It is simply Fahrenheit shifted 32°, so that zero corresponds with freezing point. This has the advantage (if advantage it be) over Fahrenheit of having zero at freezing point, while it retains Fahrenheit degrees. Nos. 5 and 6 are respectively Fifty Fahrenheit and Hundred Fahrenheit—that is, Fahrenheit degrees, only freezing point at 50 or 100 degrees respectively. The object of doing this is to practically get rid of the minus signs by fixing the zero point much lower than Fahrenheit does, which of course is a great benefit to meteorologists. Of the two, No. 6 is probably the better in having all below 100° as frosts, as having freezing point at 50° would cause almost as much confusion as it does at present at 32°, the only drawback being that all temperatures above freezing point would consist of three figures instead of two, as at present, thereby giving an additional column to add up. Nos. 7 and 8 are respectively Fifty Centigrade and Hundred Centigrade—that is, Centigrade with freezing point at 50° and 100° respectively, instead of at zero. These contain the same advantage and disadvantage that 5 and 6 do, except that in these two we should have the Centigrade degrees instead of Fahrenheit, which some might prefer. No. 9 I have termed Zero Bi-Centigrade—that is, Centigrade with 200 degrees between freezing and boiling points instead of 100 degrees, thereby reducing the degrees to half the size, which I consider a decided improvement. It has zero fixed at freezing point, to which some might object, so I have placed also on the list No. 10, or Hundred Bi-Centigrade, which is identically the same, except that instead of freezing point being placed at zero, it is placed at 100°, so as to get rid of the minus sign. Boiling point of course would be 300° on this scale. The last on the list, or No. 11, I have called Pyramid scale, that being the name given it by Prof. Piazzi Smyth, who I believe was the first to introduce it. The only drawback to it is, in the use of the plus and minus signs, while it possesses many advantages. It has the smallest degrees of any; its zero is fixed at freezing point, while at some of the chief points it has a remarkably even scale. For instance, zero is freezing point; at 5,000°, according to Prof. Smyth, platinum melts; at 1,000° iron becomes red hot or visible in the dark; water boils at 250°, and is densest at 10°; and freezing mixture (salt and snow) is, I believe, —50°. Now, no other scale will give anything like so even a set of figures; you see at a glance what the temperature is, instead of having to think how much it is above freezing or below boiling, while the awkwardness of the plus and minus sign is, I think, more than compensated for by having a scale equally simple for all; therefore, taking all things into consideration, and assuming that one scale is best for all classes, to my mind Pyramid scale is decidedly the best. I know that it would at first

be an immense difficulty to change, especially as all our readings are in Fahrenheit's scale, but if that scale is bad (and I do not think that many will say that it is perfect), and we ever intend using a better, the longer the change is delayed the greater the difficulty. Of course, for some time there would be a dreadful confusion as to which scale was meant, but that would gradually disappear, and if we adopted the Pyramid scale, I think we should all be surprised at the simple easy working of it. I expect I have put my head into a hornet's nest by opening this question, but shall be satisfied if it causes any of your readers to give their views on the subject, many of whom will doubtless have opinions differing from mine, and thus lead to some result. It is a question that requires much consideration before anything could possibly be done, but there is no harm in discussing it. I am afraid I have already trespassed too much on your valuable space, so remain, dear sir, yours very truly,

W. P. SWAINSON.

*Aspen House, Belvedere Road,*
*Upper Norwood, S.E., Jan. 1st,* 1880.

## DRY JANUARY.

*To the Editor of the Meteorological Magazine.*

SIR,—The rainfall here during January amounted to only 0·42 in., which fell on four days. This is by far the smallest amount I have registered in this month, and is no less than 2·12 in. below the average of January in the ten years 1868–77 in this district. On two out of the four days the rainfall was very trifling, and the only really wet days were the 15th and 16th. As I think such a dry January must be almost unprecedented, perhaps you may care to insert this note in your Magazine.

I am, dear Sir, yours truly,

B. T. GRIFFITH-BOSCAWEN.

*Trevalyn Hall, Wrexham, Feb. 5th,* 1880.

P.S.—We have had, as a rule, bright, clear weather of late, but with sharp frosts at night—a singular contrast to the thick fogs which have been so prevalent in London and on the southern coasts.

B. T. G.-B.

## A TRAVELLING FOG.

*To the Editor of the Meteorological Magazine.*

SIR,—A curious instance of what I consider was a London fog travelling thirty miles into the country, happened on 28th and 29th Jan. These two days were very cold and foggy, the fog appearing on the trees as thick rime. When this thawed on the 30th, it was found largely mixed with soot, quite blackening the ground. This was the case far from any human dwelling. No one about here ever remembers noticing the same before.—Yours truly,

E. W. HARVEY.

*Throcking Rectory, Buntingford, Feb. 7th,* 1880.

# REGISTER OF TEMPERATURE AT NANCY & STRASBURG.

*(continued)*

*November and December*, 1879, *and January*, 1880.

| DATE. | NANCY (town). | | Meteorological Station at Belle Fontaine. | At Enzheim, Rhine Valley, nr. Strasburg. | REMARKS (FOR NANCY). |
|---|---|---|---|---|---|
| | Min. | Max. | Min. | 8 a.m. | |
| Nov. 15... | +22 | +33 | +14 | ... | As the frost really commenced in the East of France on 15th of Nov., the min. on only two days after that date at Belle Fontaine, having been above 32°, I have thought it might be interesting to submit the complete record from that date. |
| ,, 16... | +25 | +37 | +18 | ... | |
| ,, 17... | +32 | +41 | +23 | ... | |
| ,, 18... | +39 | +50 | +36 | ... | |
| ,, 19... | +36 | +40 | +33 | ... | |
| ,, 20... | +21 | +33 | +14 | ... | |
| ,, 21... | +34 | +35 | +26 | ... | |
| ,, 22... | +35 | +41 | +30 | ... | |
| ,, 23... | +36 | +40 | +27 | ... | |
| ,, 24... | +32 | +37 | +28 | ... | |
| Here follow the observations recorded at page 188 of the *Meteorological Magazine* for last month, from 25th Nov. to 29th Dec., inclusive. | | | | | |
| Dec. 30... | +37 | +39 | +38 | ... | The thaw lasted five days, from the 30th December to the 3rd January, inclusive. |
| ,, 31... | +36 | +38 | +33 | ... | |
| 1880. | | | | | |
| Jan. 1... | +43 | +47 | +52 | +47 | |
| ,, 2... | +44 | +45 | +45 | +43 | |
| ,, 3... | +42 | +43 | +34 | +41 | |
| ,, 4... | +32 | +37 | +26 | +34 | Frost began again in earnest. From the 4th to the 10th inclusive was dull, still weather, temp. hardly changing night or day. The little wind that blew was from the E. The ice which was frozen so hard last month never went away at all. |
| ,, 5... | +25 | +31 | +16 | +23 | |
| ,, 6... | +28 | +31 | +17 | +27 | |
| ,, 7... | +28 | +28 | +24 | +27 | |
| ,, 8... | +27 | +32 | +24 | +27 | |
| ,, 9... | +28 | +35 | +27 | +27 | |
| ,, 10... | +25 | +34 | +19 | +29 | |
| ,, 11... | +26 | +33 | +24 | +21 | The 11th and 12th bright, clear, cold days. Cold wind from N.E. |
| ,, 12... | +23 | +31 | +18 | +17 | |
| ,, 13... | +17 | +28 | + 6 | +14 | |
| ,, 14... | +18 | +32 | + 8 | +12 | Snow, 6 inches. |
| ,, 15... | +26 | +29 | +13 | +30 | Cold day. Snow in Alsace. |
| ,, 16... | +20 | +32 | +10 | +12 | Ditto. |
| ,, 17... | +29 | +37 | +26 | +28 | Slight thaw for a few hours. Snow in [Alsace. |
| ,, 18... | +16 | +28 | +16 | +21 | Sharp return of cold. |
| ,, 19... | +10 | +19 | − 1 | + 4 | Cold, bright. Very cold East wind. |
| ,, 20... | + 5 | +19 | − 6 | + 1 | Cold, bright days. |
| ,, 21... | +13 | +30 | +10 | +15 | |
| ,, 22... | +15 | +28 | + 8 | +20 | Snow, 3 inches. |
| ,, 23... | +23 | +31 | +19 | +18 | |
| ,, 24... | + 6 | +30 | zero. | +18 | Dense fog and wind. |
| ,, 25... | +13 | +24 | + 5 | +12 | Bitter cold days, but clear and fine. |
| ,, 26... | + 3 | +26 | − 1 | + 6 | |
| ,, 27... | + 2 | +22 | − 5 | + 5 | |
| ,, 28... | − 1 | +19 | − 5 | − 1 | |
| ,, 29... | + 1 | +29 | − 3 | + 1 | Sharp in the morning till 11 a.m., but the sun begins to make itself felt in the day. Fine clear days. |
| ,, 30... | +11 | +30 | + 8 | +12 | |
| ,, 31... | +12 | +29 | +10 | +10 | |
| Feb. 1... | +13 | +31 | ... | + 8 | |
| ,, 2... | +14 | +35 | ... | +11 | |

+ means above zero Fahrenheit; − means below zero Fahrenheit.

The instruments and localities precisely the same as described at page 186 of the *Meteorological Magazine* for January. The max. for the Belle Fontaine are not given, as they do not show any sensible difference from those at Nancy.

The month of January shewed no such low temperatures as were recorded in December, but the average of the last fourteen days will compare for continuous cold with any previous period of similar length. The ice on the canal at the end of January is 40 centimètres =16 inches thick, and is frozen hard and clear like the American ice.

The most remarkable feature of this cold period is the amount of sunshine and absence of cloud. After scarcely ever seeing the sun all summer, it is scarcely ever now that we are without the benefit of such warmth as he can give while he is above the horizon; day after day he shines from morning to night in a cloudless sky. Except one fall of snow in November, and the great snowstorm which lasted three days from 4th to 6th December, and two slight falls last month, there has nothing whatever fallen in the shape of rain since the end of October.

G. F. PEARSON, *Colonel.*

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## MISCELLANEOUS FOREIGN NEWS.

### THE WEATHER IN SWITZERLAND.

Our Geneva Correspondent writes under date December 12:—"No cold so severe as that which now prevails has been experienced for many years. The thermometer stood here this morning at 16° below the zero of centigrade (+3°·2 F.). In North Switzerland the temperature is still lower. In Berne it varies from —18° (—0°·4 F.) to —22° (—7°·6 F.), while at Basel it has been 25° below freezing point, centigrade (—13°·0 F.). Although the Rhône is the most rapid of European rivers, ice is beginning to form along the quays and about the bridges of Geneva, and if the frost continues the stream will soon be covered with thick ice from side to side. The lake of Morat is almost practicable for skaters, and on the lake of Bienne several boats have been broken in pieces by ice floes. The Aar is frozen at Aarau, the Sarine is ice-bound from its source at the foot of the Sanfleuron to its junction with the Aar, below Laussen, and the Rumelinbach, a small stream that runs through Basel, dammed up by masses of ice and snow, has overflowed its banks and flooded an entire quarter of the city, converting the cellars and lower stories of many dwellings into veritable store-rooms of ice."—*The Times.*

### WARMTH AT GREAT ELEVATIONS.

The singular phenomenon has been frequently observed in the mountainous parts of Switzerland, Baden, Bavaria, and elsewhere on the Continent in the course of the current winter that it has been generally warmer in the elevated districts, on the hills and mountains, than in the plains and valleys. A Berne paper prints a correspondence from Flerden, in the Grisons, dated the 28th January, in which the writer says:—"For a month past we have had only two days of cloudy weather; otherwise it has been always a cloudless sky, with

the most beautiful prospect. I have been able to write at the open window, as the sun shines from 8 a.m. till 5 p.m. into my room. At 9 a.m. we have had the thermometer standing at 15° Réaumur (66° Fahrenheit), and at 1 o'clock 17° Réaumur, or 70° Fahrenheit. It is only in the night that the mercury sinks a little under freezing point." Similar reports come from the Black Forest. At Triberg, 2,268 ft. above sea level, it is stated that the inhabitants have enjoyed the most beautiful winter known there for a generation past.

### FLOODS IN SARDINIA AND SICILY.

Sardinia has been visited by inundations. At Muravera 12 out of 14 columns of a bridge were carried away, another bridge became unsafe, the whole valley of the Sarrabus was flooded, and houses and factories have been under water; but no loss of life is reported.

Eleven days' continuous rain has caused floods in Sicily. Communication between Messina and Syracuse is suspended, the railway bridge over the Alcantara has fallen in, most of the sulphur mines are inundated, and the Plain of Catania is an immense lake, boats having had to be sent to rescue peasants from the roofs of the houses. The orange and lemon plantations are in danger of being destroyed. Such a rain has been unknown since 1818.—*The Times*, Feb. 10.

### LAKES FROZEN SOLID.

The Lake of Zirknitz, in Carniola, is a solid mass of ice, myriads of fish being killed; and several large lakes in Upper Austria are also frozen solid, a phenomenon which last occurred 25 years ago. On the Lake of Constance, near Bregenz, a newspaper has been printed to commemorate the "Ice Jubilee," the lake being frozen over about once in 50 years, the last date being 1829-30.

The Maine is again frozen over at Mayence, thus once more this winter interrupting the traffic with the opposite shore. The ice was not thick enough on the 5th inst. to be crossed without danger.—*The Times*, Feb. 10.

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## THE WEATHER IN JANUARY.

On the 30th December a deep depression was advancing towards the west coast of Scotland from the Atlantic, causing very steep gradients over England and Ireland; by the next day this depression had travelled in a N.E. direction till its centre was over northern Sweden, while a second depression appeared off the west coast of Scotland; the mercury falling in the east and rising in the west later in the day. The general conditions at the beginning of the new year were hence very unsettled.

The cyclone (the latter of the two above-mentioned) had its centre over the Hebrides on Jan. 1st, but by the following day had moved away to the Norwegian coast, and continued its journey in a N.E. direction during the day, the bar. rising somewhat generally over these Islands. The depression having passed off, and no other following it, the pressure increased rapidly over these Islands, the weather becoming fine and dry.

The weather during the next seven days (6th–13th) was very dry generally, but extremely dull and gloomy over England, in a less degree also in Ireland and, during some of the time, in Scotland. Temperature, although lower than at the beginning of the month, was slightly above the mean in Ireland and the greater part of Scotland, but nearly everywhere else was as much as 4° or 5° below mean. Wind was light, except in the south-west and west, and very little rain was measured. An anticyclone had its centre, with little alteration from day to day, over England, the North Sea, and the N.E. and centre of France during the whole period, whilst a slight depression was shewn in Scandinavia till the 9th, when a brisk rise was reported. This new area of high pressure became amalgamated with the other area on the 9th, so that by the 11th the bar. was "rising over the whole of Western Europe, the anticyclone still shown in the same position, with comparatively low readings over Spain and N. Sweden"; weather generally being very fine.

The weather from this date (12th) till the 27th was generally anticyclonic. During the seven days (13th–20th) it was fine generally in Ireland and Scotland; dull, gloomy, or misty over England until the 16th, when there was a material improvement. Temperature continued below the average for time of year in *all* districts; over the greater part of England the deficit ranged from 5° to 7°, but at Marlborough was as much as 9°·7, at Strathfield Turgiss 8°·8, at Cirencester 8°·6, while at Mullaghmore it was only 1°·8, at Donaghadee 2°·1, and at Aberdeen 2°·5. Rainfall was also much less than the average nearly everywhere. The total fall was least at Spurn Head, 0·010 in., at Yarmouth 0·020 in., and at Lowestoft 0·035 in.

Similar conditions prevailed during the whole of the week following, and indeed till nearly the end of the month. Temperature was 3° below average in E. Scotland, 6° below in N.E. England and W. Scotland, and as much as 7° to 10° in all other districts. Over the inland parts of England the lowest of the min. readings at some places was on the 20th, but another very low reading was observed in some places on the 26th, and again on the 28th and 29th. On the 20th the bar. fell briskly over Scandinavia, and continued to do so the whole of the next day, but it rose again on the 22nd. A fresh fall was, however, reported on the 23rd, continuing till the 25th. On this day a fall of the bar. was reported from all W. Europe, with the exception of Sweden and Denmark, where an increase of pressure was in progress. These conditions were again reversed on the 26th, readings becoming high and uniform over England, France, and N. Germany, but moderate gradients existed in the north. On the 27th it was predicted that a large depression was approaching our N.W. coasts from the Atlantic: this proved to be correct, for on the evening of the 28th the depression was reported as over our N.W. coasts, travelling away N.E., and reaching the N.W. of Norway by the morning of the 29th, its dimensions being found very large. The continual passage of depressions in a N.E. direction along our western coasts caused the area of high pressure to draw in on its W. side from day to day, so that the mild weather which had been reported from Scotland since the 26th gradually spread over England and the western side of France. On the 31st, however, the bar. rose in all parts of the British Isles, most in the N.W., and the depressions in the W. and N. all disappeared; the area of high pressure over Germany and France thus again extended westwards, over the S.E. counties of England. As a consequence, whilst S.W. winds still prevailed over the greater part of this kingdom accompanied by mild weather, calms, fog and frost returned to the south-eastern and inland parts of England, the temp. in London being 18° lower than in the extreme S.W., and about 15° lower than in Scotland.

*Lowestoft.* H. E. M.

N.B.—I take the opportunity afforded by the beginning of a new series of articles to remark that these Summaries are drawn up entirely from the Meteorological Office "Weekly Weather Report" and "Daily Weather Report."

# SUPPLEMENTARY TABLE OF RAINFALL IN JAN., 1880.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | ·60 | XI. | Corwen, Rhug ..... | ·59 |
| ,, | Margate, Acol ..... | ·16 | ,, | Port Madoc ..... | 1·55 |
| ,, | Littlehampton ..... | ·47 | ,, | Douglas..... | ·84 |
| ,, | St. Leonards ..... | .42 | XII. | Carsphairn ... ..... | 2·71 |
| ,, | Hailsham ..... | ·49 | ,, | Melrose, Abbey Gate... | 1·00 |
| ,, | I. of W., St. Lawrence. | ·65 | XIV. | Glasgow, Queen's Park. | ... |
| ,, | Strathfield Turgiss ..... | ·57 | XV. | Islay, Gruinart School.. | 2·64 |
| III. | Great Missenden..... | ·69 | XVI. | Cupar, Kembach..... | 1·22 |
| ,, | Winslow, Addington ... | ·45 | ,, | Aberfeldy H.R.S. ..... | 1·79 |
| ,, | Oxford, Magdalen Col... | ·42 | XVII. | Tomintoul..... | ... |
| ,, | Northampton ..... | ·33 | ,, | Keith H.R.S. ..... ..... | 1·74 |
| ,, | Cambridge, Merton Vil. | ·22 | ,, | Forres H.R.S. ..... ... | ·87 |
| IV. | Harlow, Sheering ..... | ·23 | XVIII. | Strome Ferry H.R.S.... | 5·76 |
| ,, | Diss ..... | ·14 | ,, | Auchnasheen H.R.S. ... | ... |
| ,, | Swaffham ..... | ·12 | ,, | Lochbroom ..... | 3·72 |
| ,, | Hindringham ..... | ·20 | ,, | Tain, Springfield..... | 1·61 |
| V. | Salisbury, Alderbury... | ·49 | ,, | Loch Shiel, Glenfinnan. | 12·00 |
| ,, | Calne, Compton Bassett | ·61 | ,, | Dalwhinnie H.R.S..... | ... |
| ,, | Beaminster Vicarage ... | ·59 | XIX. | Lairg H.R.S. ..... | 1·66 |
| ,, | Dartmoor, Princetown.. | 2·55 | ,, | Altnabreac H.R.S. ..... | 1·06 |
| ,, | Langtree Wick ..... | ·45 | ,, | Watten H.R.S. ..... | 1·53 |
| ,, | Lynmouth, Glenthorne. | 1·94 | XX. | Fermoy, Glenville ..... | 1·98 |
| ,, | St. Austell, Cosgarne... | ... | ,, | Tralee, Castlemorris ... | ·87 |
| ,, | Taunton ..... | ·31 | ,, | Cahir, Tubrid ..... | 1·12 |
| VI. | Bristol, Ashleydown ... | ·69 | ,, | Tipperary, Henry St.... | ·90 |
| ,, | Ross ..... | ·66 | ,, | Newcastle West ..... | ·76 |
| ,, | Wem, Sansaw Hall..... | ·89 | ,, | Kilrush ..... | 1·14 |
| ,, | Cheadle, The Heath Ho. | ·44 | ,, | Corofin ..... | 1·10 |
| ,, | Bickenhill Vicarage ... | ·55 | XXI. | Kilkenny, Butler House | ·90 |
| VII. | Melton Mowbray ..... | ·43 | ,, | Carlow, Browne's Hill.. | ·90 |
| ,, | Horncastle, Bucknall ... | ·24 | ,, | Kilsallaghan..... | ·75 |
| VIII. | Walton-on-the-Hill..... | ·65 | ,, | Navan, Balrath ..... | ... |
| ,, | Broughton-in-Furness .. | 1·59 | ,, | Athlone, Twyford ..... | 1·00 |
| IX. | Wakefield, Stanley Vic. | ·18 | ,, | Mullingar, Belvedere ... | ·83 |
| ,, | Ripon, Mickley ..... | ·35 | XXII. | Ballinasloe ..... | ·88 |
| ,, | Scarborough..... | ·34 | ,, | Clifden, Kylemore ..... | 8·88 |
| X. | Gainford ..... | ·41 | ,, | Crossmolina, Enniscoe.. | ... |
| ,, | Haltwhistle, Unthank.. | ·96 | ,, | Carrick-on-Shannon ... | 1·65 |
| ,, | Shap, Copy Hill ..... | 2·17 | XXIII. | Dowra ..... | 1·78 |
| XI. | Llanfrechfa Grange ..... | ·80 | ,, | Rockcorry..... | 1·08 |
| ,, | Llandovery ..... | ·82 | ,, | Warrenpoint ..... | 1·34 |
| ,, | Solva ..... | ·74 | ,, | Newtownards ..... | ·85 |
| ,, | Castle Malgwyn ..... | ·68 | ,, | Carnlough..... | ... |
| ,, | Rhayader, Nantgwillt.. | 2·04 | ,, | Bushmills ..... ..... | 2·05 |
| ,, | Carno, Tybritle ... ..... | 1·48 | ,, | Buncrana ..... | 2·31 |

# JANUARY, 1880.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1860–5 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date. | Min. Deg. | Date. | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | Camden Square | ·31 | — 1·64 | ·19 | 16 | 5 | 55·4 | 1 | 19·2 | 27 | 21 | 26 |
| II. | | Maidstone (Hunton Court) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Selborne (The Wakes) | ·84 | — 2·43 | ·38 | 16 | 3 | 50·0 | 1,2 | 15·0 | 19 | 21 | 27 |
| III. | | Hitchen | ·26 | — 1·88 | ·12 | 16 | 7 | 52·0 | 1 | 17·0 | 27 | 29 | ... |
| ,, | | Banbury | ·50 | — 1·59 | ·26 | 16 | 10 | 47·8 | 2 | 15·0 | 20* | 27 | ... |
| IV. | | Bury St. Edmunds (Culford) | ·16 | — 1·71 | ·04 | 22 | 8 | 55·0 | 1 | 14·0 | 27 | 26 | 29 |
| ,, | | Norwich (Cossey) | ·11 | — 1·49 | ·05 | 22 | 4 | 55·8 | 1 | 17·0 | 27 | 22 | 24 |
| V. | | Bridport | ·45 | — 2·74 | ·23 | 12 | 5 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple | ·71 | — 2·81 | ·25 | 16 | 6 | 54·0 | 1,2 | 20·0 | 21† | ... | ... |
| ,, | | Bodmin | ·95 | — 4·24 | ·35 | 16 | 8 | 49·0 | 1 | 24·0 | 27 | 11 | 17 |
| VI. | | Cirencester | ·68 | — 2·32 | ·32 | 13 | 4 | ... | ... | ... | ... | ... | ... |
| ,, | | Shifnal (Haughton Hall) | ·55 | — 1·35 | ·27 | 16 | 7 | 53·0 | 1 | 12·0 | 20 | 22 | ... |
| ,, | | Tenbury (Orleton) | ·48 | — 2·05 | ·18 | 16 | 6 | 59·0 | 3 | 14·8 | 20 | 21 | 23 |
| VII. | | Leicester (Town Museum) | ·35 | ... | ·21 | 16 | 6 | 54·8 | 1 | 17·0 | 29 | 19 | 27 |
| ,, | | Boston | ·22 | — 1·49 | ·05 | 4,15 | 8 | 55·0 | 1 | 18·0 | 29 | 20 | ... |
| ,, | | Grimsby (Killingholme) | ·29 | ... | ·18 | 1 | 5 | 54·5 | 1 | 21·0 | 29 | 15 | ... |
| ,, | | Mansfield | ·39 | ... | ·18 | 15 | 6 | 53·4 | 1 | 17·7 | 20 | 22 | 20 |
| VIII. | | Manchester (Ardwick) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| IX. | | York | ·42 | — 1·16 | ·15 | 16 | 8 | 49·0 | 31 | 20·0 | 20 | 22 | 23 |
| ,, | | Skipton (Arncliffe) | ·61 | — 5·03 | ·20 | 1 | 9 | ... | ... | ... | ... | ... | ... |
| X. | | North Shields | ·38 | — 1·73 | ·24 | 16 | 4 | 57·2 | 1 | 22·2 | 20 | 19 | 19 |
| ,, | | Borrowdale (Seathwaite) | 4·77 | —11·59 | 2·06 | 30 | 12 | ... | ... | ... | ... | .. | ... |
| XI. | WALES. | Cardiff | ·87 | ... | ·42 | 13 | 11 | 54·8 | 1 | 18·0 | 21 | 18 | ... |
| ,, | | Haverfordwest | 1·02 | — 4·03 | ·42 | 16 | 8 | 53·0 | 1 | 15·1 | 21 | 16 | 19 |
| ,, | | Aberdovey | 1·31 | ... | ·48 | 15 | 5 | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno | ·70 | — 1·84 | ·29 | 15 | 4 | 56·0 | 31 | 24·2 | 21 | 15 | ... |
| XII. | SCOTLAND. | Cargen | ·82 | — 3·87 | ·31 | 1 | 8 | 51·2 | 2 | 18·0 | 21 | 15 | ... |
| ,, | | Hawick (Silverbut Hall) | 1·30 | ... | ·50 | 30 | 11 | ... | ... | ... | ... | ... | ... |
| XIV. | | Douglas Castle (Newmains) | 1·14 | ... | ·35 | 1 | 8 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Long (Arddaroch) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Kilmory | 3·41 | ... | 1·27 | 29 | 14 | ... | ... | ... | ... | ... | ... |
| ,, | | Mull (Quinish) | 5·09 | ... | 1·65 | 29 | 17 | .. | ... | ... | ... | ... | ... |
| ,, | | Loch Leven | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| XVII. | | Arbroath | ·96 | — 1·56 | ·37 | 29 | 5 | 53·0 | 1 | 23·0 | 21 | ... | 15 |
| ,, | | Braemar | 1·06 | — 2·07 | ·23 | 2 | 9 | 53·0 | 1 | 11·0 | 17 | 19 | 30 |
| XVIII | | Aberdeen (Rose Street) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Portree | 9·26 | — 3·83 | 1·78 | 29 | 19 | ... | ... | ... | ... | ... | ... |
| ,, | | Inverness (Culloden) | 1·49 | — ·79 | ·76 | 24 | 6 | 53·0 | 1 | 23·0 | 19 | 8 | 25 |
| XIX. | | Dunrobin | 2·07 | — ·58 | ·86 | 15 | 12 | 55·0 | 1 | 26·0 | 12 | 11 | ... |
| ,, | | Sandwick | 2·40 | — ·89 | ·30 | 1 | 19 | 53·1 | 1 | 31·8 | 16 | 3 | 11 |
| XX. | IRELAND. | Cork | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Darrynane Abbey | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Waterford | ·67 | — 4·19 | ·29 | 30 | 11 | 55·5 | 1 | 29·0 | 14‡ | 10 | ... |
| ,, | | Killaloe | ·86 | — 4·00 | ·34 | 29 | 9 | 53·0 | 30 | 16·0 | 23 | 13 | ... |
| XXI. | | Portarlington | ·92 | — 3·09 | ·31 | 26 | 7 | 55·0 | 1 | 21·0 | 6 | 20 | ... |
| ,, | | Monkstown | ·45 | — 2·94 | ·09 | 15 | 8 | ... | ... | ... | ... | ... | ... |
| XXII. | | Galway | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| XXIII | | Waringstown | 1·24 | ... | ·33 | 15 | 11 | 54·0 | 1 | 13·0 | 20 | 13 | 18 |
| ,, | | Londonderry | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| .. | | Edenfel (Omagh) | 1·90 | ... | ·79 | 15 | 11 | 54·0 | 1 | 14·0 | 21 | 13 | ... |

* And 28. † And 22, 23, 26, 28. ‡ And 18, 20, 23, 26.
+ Shows that the fall was above the average; — that it was below it.

# METEOROLOGICAL NOTES ON JANUARY.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

SELBORNE.—Prevailing wind north, varying a little to E. and W. The driest January I ever recorded.

HITCHEN.—The coldest January for 30 years, except Jan., 1869. Very little sunshine until the last few days. Only six drier months in the past 30 years.

BANBURY.—Mean temp. of month 32°·9. On the 27th, 28th and 29th the appearance of trees and hedges was remarkably fine; the rime being the most beautiful that has come under my notice. On the morning of the latter day the ice spiculæ were fully an inch in length, and were arranged in radiating tufts. High wind on 1st and 2nd.

CULFORD.—An exceedingly cold month; the mean temp. being only 32°·3, which is much below the average. Only two days without frost on the grass, viz., 1st and 2nd. North and easterly winds prevailed on 13 days. The month may almost be said to have been rainless, as the small amount registered (·16 in.) was mostly melted S.

COSSEY.—The driest January recorded. Observations commenced in 1858.

BODMIN.—Mean temp. 40°·0. Mean barometric pressure 30·33 in.; the highest ever registered here. On four days the mercury reached 30·60 in. As regards the rainfall of the past four months (Oct., Nov., Dec. and Jan.), I doubt whether so small a quantity has fallen in the corresponding period during ages.

CIRENCESTER.—A cold, dry month, with remarkable absence of stormy winds.

SHIFNAL.—The mild weather with which the old year closed continued till the 8th, when frost returned, equalling in severity that of December. Remarkably gloomy sky throughout, with frequent fog, which on the 28th caused a heavy rime. Wind chiefly from S.E.

ORLETON.—A very cloudy, gloomy month, with a great prevalence of fog. There were only a few slight frosts till the 13th, when about 2 in. of S fell, and frost set in again. From the 18th till the 30th the frost was very severe, and the Teme and Severn were frozen over. From the 27th to the 30th there was a thick fog, with fine rime. Mean temp. 5°·5 below the average, and the rainfall is the smallest amount recorded in January during the last fifty years, with the exception of 1855, when ·47 in. fell. Bar. very high throughout.

BOSTON.—Mean temp. of month 32°·9; 4°·5 below the average of the previous 16 years. A large proportion of the R recorded this month is due to the condensed moisture in the atmosphere; no visible R having fallen on three occasions when water was found in the rain-gauge. The total rainfall since the end of Aug. has been 6·18 in., of which 3·45 in. fell in Sept.; the average of these five months being 10·04 in. In consequence of this small fall, water is becoming very scarce in the Fens, where the chief supply for household purposes is from the rain-water collected from roofs.

KILLINGHOLME.—The driest month for 15 years, and probably more. A fine winter month, and favourable for farmers, but thrushes and smaller birds have perished in great numbers. Bar. very high and steady.

ARNCLIFFE.—The smallest fall I have ever registered in January.

## WALES.

HAVERFORDWEST.—January was characterized by a remarkable absence of R, high bar., absence of wind, and low temperature. Frost intense from the 17th to 27th; so severe a frost has not been experienced in this country since Jan., 1867; even the river Cleddy (at its eastern and western junction, where it is tidal, and fully a mile in breadth) was so completely frozen over, that it took two hours, on the morning of the 21st, to cut a passage through the ice for the ferry-boat.

LLANDUDNO.—Month bright, fine, and dry. Rainfall barely one-fourth of the average. Fifteen frosty days, and the mean temp. 6° below the average, but the cold was not unpleasantly felt, owing to the great amount of sunshine, and comparative calmness of the air.

SCOTLAND.

CARGEN.—Hard frost prevailed from the 12th to the 26th of the month. Remarkable want of sunshine, and exceptionally high barometer. L on 1st, 2nd, and 3rd.

HAWICK.—Hurricane on the 1st; then very mild and spring-like weather up to the 14th, when there was a keen frost, and 3 in. of S. fell. Very little wind during the month, but much damage has been done by the severe frosts.

QUINISH.—A fine month, except from 26th to 30th. Some slight frosts, but no S. So far, a very favourable winter for farm work and stock.

PORTREE.—Generally an open month, squally, and cold, but no severe frosts. T and L on 2nd.

CULLODEN.—Frost severe on many days and nights during the month, particularly from 5th to 26th. Vegetation retarded, but no apparent injury. Little S.

SANDWICK.—The weather was remarkably mild, owing to the prevalence of westerly wind, of which we had only one day in January, 1879, so that we had no ice on our lochs, while there was ice for skating even in the south of England. The snowdrop and the crocus are beginning to peep out in the garden; wind 50 miles an hour from 4 to 5 a.m. on 2nd, and from 10 p.m. on 2nd to 2 a.m. on 3rd.

IRELAND.

KILLALOE.—We have been favoured with the most beautiful weather ever known for January in this part of the country; some hard frosts occurred up to 27th, with bright clear days and slight winds from N. and N.E.; considerable rise in temp. towards the close of the month, and soft genial S.W. breezes.

WARINGSTOWN.—The driest January on my record (register commenced 1862), in 1876, 1·25 in. fell, but no other January comes near it.

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## TROPICAL RAINFALL, 1879.

CEYLON.—The rainfall return for Colombo has been closed to the end of last year. During 1879 there had fallen at that station 84·32 in., as compared with 139·70 in. in 1878, 105·84 in. in 1877, and 86·51 in. in 1876. The lowest return recorded was in 1875, when only 57·03 in. were registered. The highest return of rainfall during the month of October last came from the Kabragala estate, in the Nawalapitya district, where no less than 22·05 in. fell.

BRITISH GUIANA.—Christmas-tide had brought with it fine weather, but there had been several heavy falls of rain. The rainfall of last year was above the average, 110 in. having been registered. In Georgetown itself there had been only 90 in., but in Essequibo it had reached 120 in. The year's rainfall had been the heaviest known, with some trifling exception, since 1849, when no less than 132 in. fell. The heavy rainfall had severely tested the drainage power of the estates; but, with few exceptions, they had borne the test well, and only one or two districts had been flooded.—*The Colonies and India.*

SYMONS'S

MONTHLY

# METEOROLOGICAL MAGAZINE.

CLXX.] MARCH, 1880. [PRICE FOURPENCE. or 5s. per ann. post free.

## THE AUSTRALIAN METEOROLOGICAL CONFERENCE, NOVEMBER 11TH—14TH, 1879.

THIS meeting of the chiefs of most of the Meteorological systems of Australia was convoked (at the suggestion of Mr. H. C. Russell) by the Colonial Secretary of New South Wales, for the purpose of considering the following propositions:—

1. To consider the meteorology of Australia and New Zealand, with a view to united action in its investigation.

2. To consider whether additional first-class stations shall be established, and if so, in what localities.

3. To consider the desirability of using the same class of instruments at all stations and making the observations at the same local hour.

4. To consider the desirability of securing the co-operation of the meteorologists of New Zealand and Tasmania in the system of weather telegrams, which now embraces the Colonies of South Australia, Victoria, New South Wales, and Queensland.

5. To consider by what means the weather telegrams may be transmitted and published for public information at an earlier hour than they are at present.

6. To consider whether meteorological stations should be established upon the highest available mountains for the special study of winds.

The meetings were held at the Observatory, Sydney, N.S.W., and there were present—

James Hector, Esq., M.D., C.M.G., F.R.S., Inspector of Meteorological Stations, New Zealand.
C. Todd, Esq., C.M.G., F.R.A.S., Government Astronomer, South Australia.
R. L. J. Ellery, Esq., F.R.S., Government Astronomer, Victoria; and
H. C. Russell, Esq., B.A., F.R.A.S., Government Astronomer, New South Wales (Chairman).

Mr. Todd has very kindly sent us a copy of the Minutes of Proceedings, and we have much pleasure in laying before our readers an abstract of it, with just a few notes on those points respecting which we do not thoroughly agree with the delegates. The following are the resolutions adopted:—

(1). "That in view of the great importance which a better knowledge of the movement and origin of strong gales and storms on our coast lines and neighbouring seas is to the shipping and commercial interest generally, it is desirable to secure, as far as possible, co-operation in all the Australasian Colonies for the investigation of storms, as well as for agricultural and generally climatological purposes."

(2). "That with the view of giving effect to the foregoing resolution, similar observations and the same form of publication should, as far as possible, be adopted throughout the Colonies."

(2). "That in order effectively to carry out the objects of the Conference as affirmed in the foregoing resolutions, it is desirable to establish first-class meteorological stations in certain well selected positions in the several Australasian Colonies, including New Zealand, in addition to those now existing."

(4). "A first-class station may be defined as one at which the observations taken are limited to those for determining atmospheric pressure; maximum and minimum daily temperature of atmosphere, and of insolation and radiation; the average daily amount of moisture, the rainfall and number of rainy days; the force and direction of wind, and amount and character of cloud."

We regret this decision, as it conflicts with the definition of a first order station adopted at Leipzig, and the same term ought to have the same significance all the world over.

(5). "That the instruments at each first-class station consist of a mercurial barometer of either the standard or Board of Trade form; thermometers of Kew or approved patterns, compared with standards as frequently as possible; rain-gauges of 8 inches collecting diameter; and wind-gauges of any approved form. The local hours of observation to be 9 a.m., 3 p.m., and 9 p.m. Beaufort's scale of wind to be adopted; the observations to be recorded in equivalents in velocity and pressure."

(6). "That it is very desirable to obtain the co-operation of the Government of Tasmania, and to persuade them to establish a station at the public expense at Hobart Town."

(7). "That it is desirable to secure the co-operation of the Governments of Western Australia, New Zealand, and Tasmania, in the system of weather telegrams, which now embraces the Colonies of South Australia, Victoria, New South Wales, and Queensland."

(8). "That in the opinion of this Conference, it is desirable that weather telegrams and forecasts shall in all cases depend upon the observations used for general meteorological and climatological statistics, and be under the direction of the head of the meteorological department in each Colony."

(9). "That this Conference, having been informed that the Eastern Extension Telegraph Company will charge half rates for the transmission of weather reports through the cable connecting Australia and Tasmania, and probably also the cable to New Zealand, recommend that the cost of such reports be defrayed by the participating Colonies in equal proportions; and that, in the opinion of this Conference, such cost need not exceed in the aggregate £350 per annum."

"That in the opinion of the Conference, this expenditure is justified by the extreme importance to the shipping interest of early information of the approach of dangerous easterly and westerly gales."

(10). "That the several Governments be requested to cause precedence to be given to the regular weather telegrams and special storm reports."

(11). "That, in the opinion of this Conference, there should be established in each of the Colonies, upon a high mountain peak, a meteorological observatory

for the special study of winds and other meteorological phenomena, and that the most desirable positions for them would be the following :—

| | About |
|---|---|
| South Australia—Mount Lofty ... ... | 2,500 feet above sea level. |
| New South Wales—Kiandra ... ... | 4,600 ,, |
| New Zealand—Tauhara Taupo ... ... | 4,600 ,, |
| Do. Mount Herbert ... ... | 4,000 ,, |
| Tasmania—Mount Wellington ... ... | 4,000 ,, |
| Victoria—Mount Macedon ... ... | 3,500 ,, |

In the discussion upon this resolution the following remarks were made by Mr. Russell :—

The Chairman said, his object in putting this proposition before the Conference was to obtain, if possible, records of the winds that pass over-head, and were therefore lost to the records of the lower stations.

From observations made years ago by Strzelecki, it appeared that at the top of Mount Wellington, he had noticed a hot wind which was not felt at all 3,000 feet lower on the same mountain; and from similar observations in this Colony, it appeared that hot winds were frequently felt at the high stations and not at those which are at a lower level.

Similar facts might be stated with regard to the south-east gales, which frequently appeared first at lofty stations. He thought these facts were a sufficient reason for the establishment of stations on high mountain peaks,—the only means which appeared to him available to secure the desired information.

We are by no means desirous of thwarting a project which, from Mr. Russell's statement, may evidently be of great utility. But we should have thought it wiser to leave such costly undertakings as mountain stations for the consideration of a subsequent Conference. We have some fears that the erection of these mountain stations is sometimes due to a mixture of science and sensationalism.

(12). "That the revision of the present telegraph weather code be referred to Messrs. Russell and Ellery, with a view to its simplification and extension."

(13). "That the interchange of weather statistics, in carrying out the suggestions of this Conference, between the different Australasian stations, should be in the form of a diagram; and that this should not interfere with the printing of statistics by the different Colonies in any way they like."

(14). "That the monthly graphic records for interchange consist of curves, showing—Barometer, Velocity and direction of wind, Temperature, Humidity, Rainfall, with remarks upon weather, especially with reference to storms and atmospheric disturbances and that specific forms be prepared and distributed to the co-operating Colonies.

"That the mean humidity curve be derived from the means of maximum and minimum of wet and dry bulb thermometers.

"The barometer curve to be constructed from barographic records, so as to depict the turning points.

"The temperature curve to represent maximum and minimum and mean for each day.

"The velocity and direction of the wind to be deduced from the anemometer."

In this country maximum and minimum wet bulb thermometers are scarcely ever used, because the max. of the dry bulb and of the wet bulb not being necessarily synchronous, the difference between them is not always, if indeed often, a true indication of the actual difference between the dry and wet at any given instant; and the

same argument applies to the minimum. In the absence of self-recording dry and wet thermometers we should have preferred to take the mean of the humidity at 3 a.m., 9 a.m., 3 p.m., 9 p.m., obtaining the former from one of Negretti's turn-over hygrometers.

(15). "That, in the transmission of cablegrams, the reports be generalized from the local weather reports."

(16). "That the cablegrams furnished to Melbourne by Tasmania should conform with those between the Australian Colonies."

(17). "That weather telegrams from the Australian Colonies shall comprise—(1) Barometer reduced to 32° and sea level, (2) Dry bulb, (3) Humidity, (4) Maximum and minimum, (5) Direction and velocity of wind, (6) State of weather, (7) Rainfall, (8) Sea disturbances, with a synoptical report of the weather generally."

"And that within New Zealand the same system should be adopted."

(18). "That the extreme importance of the weather system proposed be strongly urged upon the Queensland Government, with a view to obtain their more active co-operation."

(19). "That Australia be divided into six meteorological areas for transmission of reports to New Zealand, viz., Western Australia, South Australia, Victoria, New South Wales and Queensland; South Australia being divided into two districts, tropical and extra-tropical."

(20). "That weather telegrams be written on paper of a special colour, so as to be readily distinguishable in the offices."

(21). "That the solar radiation thermometers should be blackened bulb thermometers *in vacuo*, and should be exposed on an open space at an elevation of 4 feet 6 inches from the surface of the ground, supported by a post carrying two light arms."

(22). "That the following subjects for experiment be referred to each member of the Conference, for future consideration and report:—

1. Shade temperature.
2. Swinging thermometer and thermometer sheds in use.
3. Standards to be swung with 2 ft. 6 in. string during sunshine and after sunset.
4. Observations to determine the difference in humidity by self-registering maximum and minimum thermometers, and by other methods.
5. The best method of measuring the velocity and pressure of wind.
6. Whether any better method than black bulb thermometers can be devised for measuring the direct effect of the sun.
7. As to the best method of determining spontaneous evaporation."

This was setting themselves some work with a vengeance; we think that it would have been far better to have divided the subjects among the delegates, instead of each of them being directed to consider and report upon them all. Several of the points have up to the present time proved beyond the solution of all the European Meteorologists. Who, for instance, can answer questions 5, 6 and 7? However, some of the Australian delegates are men of tremendous energy, and one (if not more than one) is the inventor of several very ingenious pieces of apparatus; we therefore sincerely hope that they will obey their own instructions, and after consideration, report, and finally that their reports will be collected and printed.

(23). "That as investigation of the Newcastle tide-gauges has shown that such instruments give valuable indications of distant earthquakes, gales, and

sea disturbances, it is desirable, in the opinion of the Conference, that self-registering tide-gauges be established in as many convenient places as possible on the coast, in connection with the Meteorological Departments of the different Colonies."

(24). "That the foregoing minutes be adopted as the Report of this Conference on the various matters referred to it, and that the Chairman be requested to report to the Government of New South Wales."

Thus ends the record of a meeting which, in its inception, in its programme, in the high standing of the men who attended it, and in the wisdom of nearly all its resolutions, reflects credit on the Colonies concerned. The adoption of its proposals rests with what may be called the political authorities; we hope that they will support them, for we believe that in so doing they will benefit commerce and agriculture, as well as science.

## REGISTER OF TEMPERATURE AT NANCY & STRASBURG.

*(continued from page 10)*

*To the end of the Frost of* 1879–80.

| DATE. | NANCY (town). | | Meteorological Station of Belle Fontaine. | At Enzheim, Rhine Valley, nr. Strasburg. | REMARKS. |
|---|---|---|---|---|---|
| | Min. | Max. | Min. | 8 a.m. | |
| Feb. 1... | +13 | +31 | + 8 | + 8 | Fine clear days. |
| ,, 2... | +14 | +35 | +13 | +11 | |
| ,, 3... | +20 | +30 | +15 | +12 | Dense fog and hoar frost, both at Nancy and in Rhine Valley. |
| ,, 4... | +11 | +33 | + 8 | +12 | |
| ,, 5... | +12 | +35 | + 4 | +11 | |
| ,, 6... | +17 | +38 | +11 | + 9 | |
| ,, 7... | +17 | +38 | + 9 | +12 | |
| ,, 8... | +30 | +43 | +26 | +14 | Showery, cold, and cloudy. |
| ,, 9... | +35 | +45 | +32 | +29 | |
| ,, 10... | +33 | +44 | +28 | +30 | |
| ,, 11... | +38 | +47 | +40 | +34 | |
| ,, 12... | +38 | +42 | +36 | +37 | |
| ,, 13... | +37 | +45 | +36 | +34 | Cold, with fog both at Nancy and in Rhine Valley. Fine as sun got power. |
| ,, 14... | +32 | +45 | +26 | +32 | |
| ,, 15... | +33 | +47 | +26 | +30 | |
| ,, 16... | +34 | +50 | +27 | +27 | |
| ,, 17... | +46 | +57 | +46 | +41 | Frost finally disappeared. |

I have thought that it would be interesting to have the complete record of the severest frost of this century in the east of France and the Rhine valley, and therefore send the register of the temperature in continuation till 17th February, when the frost finally broke up. The remarkable part of it was the very gradual disappearance of the frost between the 8th and 17th, with mild showery weather, and no determined thaw. This was of the greatest benefit to the country, and prevented many disasters from the too sudden breaking up of the banks of ice, which had formed in all the rivers.

GEO. F. PEARSON, COLONEL.

## REVIEWS.

*Report of the Meteorological Service of the Dominion of Canada for the Year ended 31st December*, 1877. Ottawa: Maclean & Co.

In many respects this report is the best which we have received from Professor Kingston, many important elements being given in all necessary detail. We wish, however, that this report gave fuller particulars respecting the instruments employed and their mounting. Recollecting as we do the generally excellent character of the instructions to observers prepared by Prof. Kingston, we do not believe that there is much to fear respecting the organization of his stations, but the table on pages 209—212 affords ample room for two or three extra columns, which might be devoted to diameter of rain gauge, height of mouth of rain gauge, and height of thermometer bulbs above soil. We are glad to see that an accurate map of the Dominion accompanies the report; it would be improved in appearance, and in clearness, by the whole of the lakes and seas being shaded, so as to mark out prominently the distribution of land and water.

Perhaps the most remarkable feature of Canadian meteorology is the great range of temperature. Table VI. of the above report gives the highest and lowest temperature at each of about seventy stations, and we have worked out the following results from that table:—

*Maximum Temperatures.*—At four stations the highest temperature in the year did not reach 80°; these were all coastal stations, two in Newfoundland, one in New Brunswick, and one (Esquimault) to the south of Vancouver's Island, British Columbia. At sixty-six stations the max. was 80° or above, at thirty-seven it was 90° or above, at seven it was above 95°, and at two it exceeded 100°, being 105° at Spence's Bridge, British Columbia, on July 20th, and 109° at Fort Macleod, North-west Territory, on July 21st. These two stations are nearly in the same latitude (50°) and are about 500 miles apart, the former being on the east and the latter on the west of the Rocky Mountains.

The more remarkable feature of Canadian climate is the severely low temperatures which are usual. The *minimum temperature* is reported from 71 stations; of these there are only three at which the temperature did not fall to or below zero. The warmest of these three is the station already mentioned as having one of the lowest maxima, viz., Esquimault, where the max. for the year was 76°·9, and the min. 25°, or an entire range of 51°·9. At the majority of stations the min. were below —10°; at thirty-four stations they were below —20°, at eleven stations below —30°, and at five stations below — 40°. We give the details of these extremely low values:—

| | Lat. | Lon. | Minimum Temp. | Date. |
|---|---|---|---|---|
| Fort Garry, Manitoba ..... | 49° 53′ N | 97° 7′ W | —44°·3 | Jan. 14. |
| York Factory, N.W. Territory | 57° 0′ N | 92° 26′ W | —45°·0 | ,, 11. |
| Winnipeg, Manitoba..... | 49° 55′ N | 97° 7′ W | —47°·6 | ,, 15. |
| Battleford, N.W. Territory... | 52° 41′ N | 108° 30′ W | —51°·0 | ,, 11. |
| Kalmar, Keewatin, ,, ... | 49° 45′ N | 94° 58′ W | —63°·0 | ,, 14. |

It seems to us rather a pity that the observations during this cold spell are not fully worked out. The only further facts which we can find in other parts of the volume, respecting the temperatures at Battleford and Kalmar, are the following:—At Battleford the min. on the 11th was —51°, the max. on that day was zero, and the mean of readings at 8 a.m., 2 p.m., and 8 p.m. was —31°.

At Kalmar the mean of observations at 7 a.m., 2 p.m., and 9 p.m. (giving double weight to the 9 p.m. observations) was on the 14th —38°·8, and on the 15th —32°·6. There can, therefore, be no doubt as to the truthfulness of these excessively low temperatures, *ninety-five Fahrenheit degrees* below freezing point, —63° Fahrenheit, or —52°·8 Centigrade.

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*Ciel et Terre: Revue Populaire d'Astronomie et de Météorologie.* Bruxelles: F. Hayez. 8vo.

WE have great pleasure in calling the attention of our readers to this new magazine, for every step which tends to increase the number of persons familiar with meteorological facts, tends necessarily towards the supply of that which we have always held to be the greatest want in the meteorological world—viz., "neither more observations nor more money (though neither of these is to be despised), but more brains, more hard workers, more deep thinkers." The magazine is written in an extremely lucid style, and the first number—that for March 1st, 1880—exactly accords with the following paragraph in the Prospectus:—

"The Review of Astronomy and Meteorology is intended to exhibit in language comprehensible by all, both the facts and general theories upon which the sciences are based, as well as the new discoveries with which ceaseless labours are ever enriching them. While by its exposition of fundamental facts and generalisations it will maintain a popular character; it will be, by its bibliographies, and by the scientific notes which it will contain, a sure and faithful guide for those who are attentively following the progress of science or are themselves co-operating in its advancement."

We quote one more paragraph:—

"If, by its popular character, the Review is accessible to the general public, it is equally so by its exceptionally moderate price. We believe that these considerations are such as to ensure the success of our enterprise and to obtain for it the sympathies of all who, both in Belgium and abroad, appreciate fully the importance of the diffusion of scientific knowledge."

The promoters may well say that the price is "exceptionally moderate." Each number is to contain 24 pages; there are to be two numbers each month, *i.e.*, 24 numbers per annum, and therefore nearly 600 pages; and this is to be sent post free for eight shillings to anyone who will send a post office order for that amount to

M. C. Hooreman, rue du Cadran, 10, à St. Josse-ten-Noode, Belgium. Either Belgian printers work for half the price of English ones, or else we fear that the proprietors will have some difficulty in making both ends meet. That, however, is their business; ours merely is to tell our readers that we believe that they will get ample return for their money.

In concluding, we give the list of Editors and the Contents of the first number. We do not translate or reproduce any of the articles, because we advise those of our readers who are familiar with, or desire to refresh their, French, to get the original.

EDITORS.

| *Astronomical.* | *Meteorological.* |
|---|---|
| Estourgies, L. | Hooreman, C. |
| Fievez, C. | Lancaster, A. |
| Lagrange, C. | Van Rysselberghe, F. |
| Niesten, L. | Vincent, J. |

CONTENTS.

J. C. Houzeau, La conquête de l'heure.—A. Lancaster, Les grands froids de Décembre, 1879.—C. Fievez, L'analyse spectrale.—L. Niesten, Le ciel pendant le mois de mars.—J. Vincent, Revuè météorologique de la quinzaine.—Notes.—A. Lancaster, Bibliographie.

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*Annual Report of the Chief Signal Officer to the Secretary of War for the year* 1878.—Washington : Government Printing Office. 8vo.

THIS is, we think, the largest volume which we have ever seen without either an index or a table of contents. It contains several excellent notes, papers and suggestions, but it ought to have some list of its contents. What would the "Index Society" say to a book of nearly 700 pages, with probably more than a hundred maps and engravings, and absolutely nothing to tell one in what part of the volume to look for any single subject.

The Signal Office is really a wonderful establishment, and while we should prefer to see in several respects more science and less show, we heartily recognise the vigorous not to say overwhelming energy and comprehensiveness which characterise the office. With an enormous staff (we saw the numbers a few minutes since, but for want of an index we cannot now find them,) and a very large supply of money, the department seems to undertake nearly everything—from shooting Indians to saving shipwrecked mariners—it issues weather warnings, and farmers' bulletins, looks after injurious insects, records the freezing of rivers, the level of the water when they are free from ice, gives notice of the advance of floods, reports upon sun spots, prairie fires, shipping disasters, the swarming of bees, &c., &c.

We regret to see that at very many, if not at the majority of

stations, the instruments are exposed at windows at considerable heights above the ground, and we infer that many of the rain gauges are upon roofs. A single table giving tabular details on these points would be satisfactory, especially if it showed that our impression upon this point is erroneous.

Very full and illustrated descriptions are given of tornadoes in February and August, 1878. Sergeant Reed concludes his report upon one of these with the following words:—

"Thirty persons lost their lives, and seventy others [were] more or less injured, Fifty-five houses and barns were completely and [? or] partly demolished; careful estimates of loss of property destroyed by the tornado $250,000 [£52,000.]

## THE FROST OF DECEMBER, 1879, OVER THE BRITISH ISLES.

*(Read at the Meteorological Society's Meeting on February 18th, by* W. MARRIOTT, F.M.S.*)*

EXCEPTIONALLY low temperatures were registered all over the British Isles from the 1st to the 7th of December. On the 1st the lowest temperature was —2° at Ketton, near Stamford, and the next lowest was 5° at Trent College. The temperature continued low throughout the day, at several places not rising above the freezing point. On the 2nd the cold was more intense. In the counties of Leicester, Lincoln, and Nottingham the temperature fell below zero, the lowest being —4°·5 at Coston, near Melton Mowbray. Temperatures between 0° and 10° were registered in the north and south of Scotland, and along the central part of the north of England to the midland and eastern counties; while over the whole of England, Scotland, and Ireland, with the exception of the sea-coast stations, the temperature fell below 20°. On the 3rd the temperature was more evenly distributed and not quite so intense as on the previous day; however, in the North Riding of Yorkshire and the valley of the Tees readings at and below zero were registered, the lowest being —2° at Gainford. On the 4th intensely cold weather was experienced over the south of Scotland and the north of England. The lowest reading obtained was —23° at Blackadder in Berwickshire; —16° was also registered at Springwood Park, near Kelso; and readings of —5° were reported at Haddington, Melrose, and Corbridge-on-Tyne, and —4° at Alston. Temperatures below 10° were registered over the south and south-east of Scotland, and over the north of England as far as the valley of the Trent, and also in the eastern counties; while over almost the whole of England, Scotland, and Ireland the temperature fell below 20°. In some parts of the south of Scotland and the border counties the maximum temperature during the day did not rise to 20°. On the 5th the minimum temperature was not so low as on the previous day, there being a cloudy sky and a general fall of snow; in Ireland, however, this was the coldest day of the month. On the 6th the temperature fell considerably in Derbyshire,

Nottinghamshire, and Yorkshire; readings of —3° being recorded at Trent —1° at Buxton, and 0° at York and Stanley. At many places the maximum temperature during the day was much below the freezing point. On the 7th very low temperatures were registered over the whole of the north and east of England; the lowest reported was —10° at Ketton near Stamford. The temperature fell below zero in the counties of Essex, Leicester, Derby, Lincoln, Nottingham and York, and also in the south of Scotland, while over almost the whole of the N.E. and central part of England as well as a portion of the S.E. district the temperature fell to 10° or below. Readings below 20° prevailed over nearly the whole of England and Scotland and the centre of Ireland. The maximum temperature during the day at a few places was extremely low, the thermometer at Appleby only recording 12°·4, and that at York 18°. During the next few days a little warmer weather prevailed, but on the 11th the temperature fell below 20° over the central part of England, Scotland, and Ireland. Low temperatures were also experienced at most places on the 12th. Milder weather continued for the next few days, but on the 17th the temperature again fell below 20° over the whole of the south of England. Low temperatures also prevailed on the 18th, 21st, 23rd, 24th, and 26th, while the maximum temperatures at many places on the 21st and 26th did not reach 32°. At almost all the inland stations frost occurred on an average of about twenty-five days during the month, and temperatures below 20° were registered from eight to thirteen days at several places. The only station where frost was not felt was Scilly, the lowest temperature recorded there being 33° on the 2nd.

The only comparatively mild districts were the west and south of Ireland and the extreme south-west of England. Even the seaside health resorts, which are reputed for their mild climates, were not exempt from the cold, the temperature falling below the freezing point on eleven occasions at Ventnor, fifteen at Torquay, twenty at Sidmouth and Eastbourne, and twenty-four at Ramsgate and Worthing.

During the time of the cold weather the barometer was very high over these islands, and an anticyclone was formed over those districts where the lowest temperatures were recorded. That the cold was the result chiefly of radiation is shown by the great difference in temperature at the hill and valley stations. For instance, at Farley, 640 feet above sea level, 17°·7 was registered on the 7th, while at Oakamoor, 300 feet lower in the Valley of the Churnet and less than a mile distant from Farley, the temperature fell to 1°·1.

The effect of the cold upon the health of the community was very great. In London the number of deaths referred to diseases of the respiratory organs increased to 799 in the week ending December 20th, and exceeded the week's average by 288. The public journals record the fact that several persons were frozen to death in various parts of the country. The frost also caused great injury to plants, shrubs, and birds.

# SUPPLEMENTARY TABLE OF RAINFALL IN FEB., 1880.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 3·35 | XI. | Corwen, Rhug ..... | 4·20 |
| ,, | Margate, Acol ..... | 1·73 | ,, | Port Madoc ..... | 2·90 |
| ,, | Littlehampton ..... | 3·31 | ,, | Douglas..... | 3·67 |
| ,, | St. Leonards ..... | 2·90 | XII. | Carsphairn ... ..... | 7·67 |
| ,, | Hailsham ..... | 3·28 | ,, | Melrose, Abbey Gate... | 3·52 |
| ,, | I. of W., St. Lawrence. | 2·93 | XIV. | Glasgow, Queen's Park. | ... |
| ,, | Strathfield Turgiss ..... | 3·51 | XV. | Islay, Gruinart School.. | 3·46 |
| III. | Great Missenden ..... | 3·56 | XVI. | Cupar, Kembach..... | 2·63 |
| ,, | Winslow, Addington ... | 2·81 | ,, | Aberfeldy H.R.S. ..... | 6·27 |
| ,, | Oxford, Magdalen Col... | 2·22 | XVII. | Tomintoul..... | 2·42 |
| ,, | Northampton ..... | 2·72 | ,, | Keith H.R.S. ..... ..... | 2·44 |
| ,, | Cambridge, Merton Vil. | 1·63 | ,, | Forres H.R.S. ..... ... | ·98 |
| IV. | Harlow, Sheering ..... | 2·00 | XVIII. | Strome Ferry H.R.S.... | 8·31 |
| ,, | Diss ..... | 1·73 | ,, | Auchnasheen H.R.S. ... | ... |
| ,, | Swaffham ..... | 1·82 | ,, | Lochbroom ..... | 5·05 |
| ,, | Hindringham ..... | 1·67 | ,, | Tain, Springfield..... | ·84 |
| V. | Salisbury, Alderbury... | 4·15 | ,, | Loch Shiel, Glenfinnan. | 14·58 |
| ,, | Calne, Compton Bassett | 3·72 | ,, | Dalwhinnie H.R.S..... | ... |
| ,, | Beaminster Vicarage ... | 5·06 | XIX. | Lairg H.R.S. ..... | 3·29 |
| ,, | Dartmoor, Princetown.. | 11·61 | ,, | Altnabreac H.R.S. ..... | 3·85 |
| ,, | Langtree Wick ..... | 4·39 | ,, | Watten H.R.S. ..... | 2·18 |
| ,, | Lynmouth, Glenthorne. | 6·69 | XX. | Fermoy, Glenville ..... | 5·84 |
| ,, | St. Austell, Cosgarne... | 3·98 | ,, | Tralee, Castlemorris ... | ... |
| ,, | Taunton ..... | 4·55 | ,, | Cahir, Tubrid ..... | 5·06 |
| VI. | Bristol, Ashleydown ... | 4·50 | ,, | Tipperary, Henry St.... | 4·11 |
| ,, | Ross ..... | 4·88 | ,, | Newcastle West ..... | 3·65 |
| ,, | Wem, Sansaw Hall..... | 2·29 | ,, | Kilrush ..... | 4·18 |
| ,, | Cheadle, The Heath Ho. | 2·76 | ,, | Corofin ..... | .. |
| ,, | Bickenhill Vicarage ... | 3·36 | XXI. | Kilkenny, Butler House | ... |
| VII. | Melton Mowbray ..... | 1·81 | ,, | Carlow, Browne's Hill.. | 4·07 |
| ,, | Horncastle, Bucknall... | 1·95 | ,, | Kilsallaghan..... | 2·47 |
| VIII. | Walton-on-the-Hill..... | 1·34 | ,, | Navan, Balrath ..... | 2·07 |
| ,, | Broughton-in-Furness .. | 5·17 | ,, | Athlone, Twyford ..... | 3·20 |
| IX. | Wakefield, Stanley Vic. | 1·52 | ,, | Mullingar, Belvedere ... | 2·77 |
| ,, | Ripon, Mickley ..... | 3·04 | XXII. | Ballinasloe ..... | 2·94 |
| ,, | Scarborough..... | 1·62 | ,, | Clifden, Kylemore ..... | 8·98 |
| X. | Mickleton..... | ... | ,, | Crossmolina, Enniscoe.. | 5·69 |
| ,, | Haltwhistle, Unthank.. | 2·27 | ,, | Carrick-on-Shannon ... | 3·76 |
| ,, | Shap, Copy Hill ..... | 8·13 | XXIII. | Dowra ..... | 2·82 |
| XI. | Llanfrechfa Grange ..... | 4·07 | ,, | Rockcorry..... | 2·78 |
| ,, | Llandovery ..... | 4·99 | ,, | Warrenpoint ..... | 2·78 |
| ,, | Solva..... | 3·28 | ,, | Newtownards ..... | 2·24 |
| ,, | Castle Malgwyn ..... | 4·52 | ,, | Carnlough..... | 3·54 |
| ,, | Rhayader, Nantgwillt.. | 8·24 | ,, | Bushmills ..... ..... | 2·08 |
| ,, | Carno, Tybritle ... ..... | 4·27 | ,, | Buncrana ..... | 2·24 |

## THE WEATHER IN FEBRUARY.

At the beginning of the month a decrease in atmospheric pressure was in progress in the S. and in the countries to the eastward of the North Sea, while elsewhere the bar. was rising slightly. Pressure, as at the close of January, was highest over E. France and lowest (29·2) in the N. of Sweden; depressions passing northward near our western coasts. On the following day (2nd) owing to a brisk rise of the bar. in Sweden, gradients became less steep, and wind was very generally from S.W. to S.E. over Europe.

A brisk fall of temp. occurred on the 1st over the greater part of England, and a sharp frost was reported from the S. The maximum was, however, as high as 50° in many places. Changes in temp. on the 2nd, slight and irregular.

The general conditions of the next seven days (2nd–9th) were in an unsettled, changeable state. For the first three days it was dull and rather rainy in Ireland, fair over Scotland and the greater part of England, and dry but very foggy in S.E. England. By the evening of the 6th, the unsettled weather in the W. had extended to all parts of these Islands, and, with brief intermissions, of clear weather, continued to the end of the week.

Temp. during the same period was about the mean for time of year in E. and S. England, but slightly above the average elsewhere. Sharp frosts occurred at most places in E. and S.E. England until the 6th or 7th. The greatest excess above the average was at Kelstern, Lincolnshire (6°·0), and the greatest deficit (1°·5) at York and Dover. Wind for the most part S.W.; rainfall rather above mean, except in the N. of Ireland and Central England.

The weather of the following week partook of the same character as its predecessor. Depressions were shewn off our N.W. coast and over France on the 11th, with a rapid fall of the bar. in the W. The depression over France had disappeared by the next day, but others continued to advance, in rapid succession, to our S.W. and W. coasts. A general and rapid decrease of pressure occurred on 16th, the change being more than half-an-inch in all parts of these Islands except N.E. Scotland, and amounting to an inch in the S.W. The depression had its centre (28·6) near Scilly in the morning, and passed slowlynorthwards during the day, while pressure recovered in the S.W.

Temp. was rather above average in N.E. and S. England, below it in Ireland, and about the mean in all other districts. Several slight frosts were experienced during the night-time in central, N. and E. districts. Wind S.E. to S.W. nearly everywhere. Rainfall less than mean in N.W. England and over Scotland, but more elsewhere. At Hurst Castle the total for the week was as much as 1·93 inch, at Strathfield Turgiss, 1·66 Jersey 1·31, while, at Lowestoft it was 0·58 inch, at Durham 0·48, at Manchester 0·30 in.

Very similar were the conditions of the remainder of February. On the 17th the depression above-named, as having its centre over the Scilly Islands on the 16th, was shewn over our western coast, moving *very* slowly northwards; by the 21st the centre was between the Shetlands and the W. coast of Norway, at which stage of its progress it altered its course, taking a S. direction. On the 22nd a large area of low pressure was over England and the North Sea, travelling deliberately in a southerly direction. This area had shifted till it was over France on the 23rd, the bar. having risen everywhere.

On the 24th, the weather over these Islands and their neighbourhood was very settled. A depression, which, on the morning of the 23rd was off our S.E. coasts, apparently united with that which had been travelling southward till it reached the Mediterranean near Toulon, so that an extensive area of low pressure was shown over S.E. France and N. Italy, while pressure was recovering over these Islands and France. Over these Islands the bar. readings were moderately high and extremely uniform. A considerable change in the general distribution of pressure occurred next day. A large and deep depression advanced to the N. of Scandinavia, the mercury fell more than half an inch in that region, the decrease extending quickly to the whole of Sweden, Norway, Denmark, and the northern parts of the United Kingdom. In the S. part of these Islands, however, and over France, the bar. rose, and an

elongated area of high pressure lay over Ireland, England, N. France, and the Netherlands, while a second area of *low* pressure was over the Gulf of Lyons. Consequently W. to S.W. winds were reported from the more Northerly part of W. Europe, light airs in S. England, and N.E. winds in the more Southerly part of W. Europe.

During the night 25th–26th an important subsidiary depression appears to have passed from N.W. to S.E. in the neighbourhood of our northern coasts, and by the morning of the 26th was, apparently, over S. Scandinavia. As a consequence, the bar. fell over the whole of W. Europe, the fall varying from a few hundredths in the W. of France to about 0·7 inch in E. England. During the night 27th–28th a fresh disturbance passed from W.N.W. to E.S.E. across N. Scotland, occasioning a brisk fall of the bar. over these Islands, and a somewhat less brisk fall elsewhere. In addition to this main disturbances, small subsidiaries were shown on our W. coasts. From these disturbances, pressure, however, soon recovered and the bar. rose quickly in N. Scotland and slightly in W. Ireland. The wind, though it remained W. on our S. coasts, over France, and to the eastward of the North Sea, veered to N.W. in Scotland, and to W.N.W. in Ireland. Temp. rose everywhere, and varied from 49° in the S.W. to 37° in the Shetlands.

Temp. during the week (17th–23rd) was 4° above the average for time of year in the E. and N., and 3° nearly everywhere else. Rainfall was in excess of mean, except in N. Ireland. During the last few days of the month rainfall was very slight.

*Lowestoft.* H. E. M.

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## A VARIETY OF HOAR FROST.

*To the Editor of the Meteorological Magazine.*

SIR,—A rather remarkable variety of hoar frost was observed here on the last two days of January and the 1st of the present month. It differed from the more common kind in the conditions under which it occurred. Generally, no doubt, hoar frost is due to the cooling of the ground below the temperature of the air by radiation. In this case the relatively low temperature of the ground was evidently occasioned by the slowness with which the earth, cooled by a long frost, became affected by the thaw then prevailing.

This hoar frost differed also from others in the situations in which it was found, being scarcely less abundant on the roadways, pavements and gravel walks than on the grass. The roads were so white as to give the impression of a thin covering of snow. It was also deposited thickly on the perpendicular faces of walls. Another point noticed was its persistence during the day, notwithstanding maximum temperatures of 43° and 48°. All these peculiarities seem referable to the circumstances mentioned above.

But the most interesting feature was the form of the crystals. On the grass these had the form of scale-like or leaf-like expansions, which seemed to grow day by day until they acquired a diameter of one-third of an inch. *Inter se*, these scales were more or less imbricated, and in some cases, being arranged closely around a short central axis, they approached, in the aggregate, the form of a "double" flower.

GEORGE F. BURDER, M.D.

*Clifton, 11th Feb.*, 1880.

# FEBRUARY, 1880.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1860–5 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date. | Min. Deg. | Date. | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | Camden Square | 2·33 | + 1·11 | ·44 | 16 | 19 | 53·7 | 16* | 27·0 | 2 | 8 | 17 |
| II. | | Maidstone (Hunton Court) | 2·21 | + ·99 | ·50 | 7 | 17 | ... | ... | ... | ... | ... | ... |
| ,, | | Selborne (The Wakes) | 3·93 | + 2·22 | ·66 | 15 | 21 | 55·0 | 28 | 27·5 | 1 | 6 | 11 |
| III. | | Hitchen | 2·08 | + ·82 | ·55 | 16 | 18 | 52·0 | 20 | 28·0 | 4§ | 12 | ... |
| ,, | | Banbury | 3·60 | + 2·17 | 1·07 | 18 | 23 | 53·0 | 19 | 25·0 | 1 | 15 | ... |
| IV. | | Bury St. Edmunds (Culford) | 1·66 | + ·24 | ·33 | 16 | 16 | 56·0 | 29 | 26·0 | 1‖ | 12 | 13 |
| ,, | | Norwich (Cossey) | 1·73 | + ·13 | ·33 | 16 | 15 | 58·0 | 19 | 23·5 | 1 | 14 | 14 |
| V. | | Bridport | 4·18 | + 2·12 | ·81 | 16 | 21 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple | 4·34 | + 2·26 | ·98 | 18 | 24 | 57·0 | 20 | 29·0 | 25 | ... | ... |
| ,, | | Bodmin | 5·62 | + 2·83 | 1·26 | 15 | 22 | 55·0 | 19 | 32·0 | 24 | 1 | 9 |
| VI. | | Cirencester | 3·89 | + 2·28 | ·94 | 18 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | | Shifnal (Haughton Hall) | 2·12 | + 1·23 | ·55 | 16 | 22 | 53·0 | 19 | 26·0 | 25 | 10 | 16 |
| ,, | | Tenbury (Orleton) | 4·05 | + 2·48 | ·71 | 16 | 22 | 55·5 | 4 | 26·7 | 25 | 11 | 12 |
| VII. | | Leicester (Town Museum) | 2·35 | ... | ·88 | 16 | 18 | 56·8 | 18 | 25·9 | 1 | 4 | 18 |
| ,, | | Boston | 1·94 | + ·73 | ·61 | 16 | 18 | 55·0 | 19 | 26·0 | 1 | 11 | ... |
| ,, | | Grimsby (Killingholme) | 1·71 | ... | ·47 | 16 | 16 | 54·0 | 29 | 32·0 | 27 | 0 | ... |
| ,, | | Mansfield | 2·21 | ... | ·70 | 16 | 18 | 52·5 | 29 | 29·9 | 8 | 10 | 13 |
| VIII. | | Manchester (Ardwick) | 2·29 | + ·45 | ·37 | 28 | 18 | 52·0 | 1† | 31·0 | 1,6 | 4 | ... |
| IX. | | York | 1·76 | + ·38 | ·57 | 16 | 13 | 56·5 | 19 | 27·0 | 6 | 10 | 14 |
| ,, | | Skipton (Arncliffe) | 6·33 | + 2·66 | ·91 | 19 | 25 | 50·0 | 1 | 25·0 | 5 | 7 | ... |
| X. | | North Shields | 1·49 | — ·04 | ·32 | 16 | 15 | 52·3 | 19 | 29·0 | 9 | 4 | 5 |
| ,, | | Borrowdale (Seathwaite) | 17·07 | + 5·69 | 1·78 | 19 | 27 | ... | ... | ... | ... | ... | ... |
| XI. | WALES. | Cardiff | 3·88 | ... | 1·06 | 18 | 22 | 54·8 | 19 | 27·8 | 1 | 3 | ... |
| ,, | | Haverfordwest | 4·20 | + 1·34 | ·90 | 15 | 21 | 53·5 | 19 | 25·0 | 23 | 5 | 14 |
| ,, | | Aberdovey | 1·91 | ... | ·21 | 5,15 | 20 | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno | 1·75 | + ·40 | ·23 | 17 | 19 | 55·2 | 2 | 32·0 | 6 | 1 | ... |
| XII. | SCOTLAND. | Cargen | 5·19 | + 2·60 | ·64 | 17 | 22 | 51·4 | 28 | 30·8 | 11 | 2 | ... |
| ,, | | Hawick (Silverbut Hall) | 3·28 | ... | ·64 | 7 | 21 | ... | ... | ... | ... | ... | ... |
| XIV. | | Douglas Castle (Newmains) | 5·55 | ... | ·78 | 28 | 22 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Long (Arddaroch) | 11·17 | ... | 1·32 | 29 | 21 | 45·0 | 5 | 27·0 | 9 | 10 | ... |
| ,, | | Kilmory | 5·99 | ... | ·76 | 6 | 24 | ... | ... | 29·0 | 23 | 7 | ... |
| ,, | | Mull (Quinish) | 6·70 | ... | 1·13 | 6 | 23 | ... | ... | ... | ... | ... | ... |
| ,, | | Loch Leven | 2·50 | + ·20 | ·60 | 6 | 13 | ... | ... | ... | ... | ... | ... |
| XVII. | | Arbroath | 2·25 | + ·40 | ·55 | 7 | 15 | 54·0 | 29 | 29·0 | 9 | 4 | ... |
| ,, | | Braemar | 4·71 | + 2·73 | 1·00 | 6 | 21 | 49·8 | 29 | 18·8 | 9 | 8 | 20 |
| XVIII | | Aberdeen (Rose Street) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Portree | 10·17 | — ·06 | 1·29 | 4 | 27 | ... | ... | ... | ... | ... | ... |
| ,, | | Inverness (Culloden) | 1·58 | — ·30 | ... | ... | ... | 53·0 | 4 | 26·0 | 9 | 3 | 16 |
| XIX. | | Dunrobin | 1·33 | — 1·19 | ·26 | 27 | 16 | 55·5 | 3 | 28·5 | 9 | 6 | ... |
| ,, | | Sandwick | 3·91 | + 1·43 | ·44 | 29 | 25 | 51·9 | 4 | 32·0 | 9 | 1 | 7 |
| XX. | IRELAND. | Cork | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Darrynane Abbey | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Waterford | 3·68 | + 1·65 | ·56 | 16 | 22 | 53·0 | 20‡ | 29·0 | 11 | 5 | ... |
| ,, | | Killaloe | 3·71 | + ·81 | ·46 | 19 | 25 | 56·0 | 20 | 24·0 | 11 | 10 | ... |
| XXI. | | Portarlington | 2·04 | + ·01 | ·31 | 15 | 24 | 55·0 | 4 | 30·0 | 10 | 3 | ... |
| ,, | | Monkstown | 2·66 | + 1·02 | ·55 | 7 | 17 | ... | ... | ... | ... | ... | ... |
| XXII. | | Galway | 3·70 | ... | ·66 | 6 | 24 | 54·0 | 21 | 32·0 | 13¶ | 2 | ... |
| XXIII | | Waringstown | 2·67 | ... | ·60 | 16 | 23 | 56·0 | 29 | 27·0 | 14 | 5 | 15 |
| ,, | | Londonderry | 2·59 | ... | ·36 | 29 | 22 | 54·0 | 4 | 31·0 | 15 | 2 | 13 |
| ,, | | Edenfel (Omagh) | 2·21 | ... | ·37 | 29 | 22 | 54·0 | 4 | 25·0 | 10** | 11 | ... |

* And 18, 20, 28. † And 10, 12, 18, 28, 29. ‡ And 28. § And 24. ‖ And 4, 24.
¶ And 15. ** And 12.

\+ Shows that the fall was above the average; — that it was below it.

# METEOROLOGICAL NOTES ON JANUARY.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

SELBORNE.—Bar. very high during the first week. Wind variable, principally from S.W. H on 8th and 12th.

BANBURY.—A great deal of high wind during the month. Floods on 17th and 19th.

CULFORD.—Mean temp. of month 41°·6. Easterly winds prevailed on 11 days. T with H on 20th.

COSSEY.—A genial month, favourable to the growth of the wheat crop, which is backward.

BODMIN.—Mean temp. of month 44°·7. A very genial month, and the large rainfall was most welcome when the droughts of the four previous months had almost dried up the springs.

CIRENCESTER.—Foggy, with S.E. wind, and frost at the beginning of the month, afterwards seasonable weather with more than average rainfall.

SHIFNAL.—A genuine February. R falling on 22 days, but with the exception of one heavy fall, chiefly in small quantities; much fog throughout, with wind persistently S., S.W., and S.E. till 23rd, N. and N.W. on the last 5 days. Winds frequently heavy, and on the 26th violent with H. Snowdrops showing on 5th; aconites showing on 10th; snowdrops full out on 25th.

ORLETON.—Temp. variable, but on the whole rather more than 1° above the average. Fogs were frequent at the beginning of the month, and the sky was generally covered with clouds, but there were a few fine days. The first four days were dry, but afterwards there were only three days without R. Bar. generally low. The wind was very strong on the 7th and 28th, and was frequently rough.

GRIMSBY.—A very seasonable month, many days fine and pleasant. A great contrast to February 1879. T on 18th and 20th. Snowdrops in flower on 18th; violets in flower in sheltered nooks on 20th; rooks building on 23rd; crocus in flower on 26th.

ARDWICK.—On the whole a temperate month, but the weather was broken and unsettled. The wind was rather rough on two or three occasions, but there was little frost.

YORK.—A decided change in the general character of the weather after the first week. The dry period had quite passed. Mock sun on 10th. Very dark on 20th, making gaslight necessary at midday.

## WALES.

HAVERFORDWEST.—A wet chilly month, very stormy and wild, but with very little frost, and although R fell frequently there was only one heavy fall. A great barometric depression on the 8th and 9th, with a hard gale lasting nearly 36 hours, lowest reading 28·787 in. (corrected), and another on the 15th and 16th. The night of the 14th was remarkably fine, clear, and frosty, with T at midnight, about 5 a.m. on 15th the wind backed to S.E. and began to blow, increasing to a furious gale, with heavy R, the storm lasted through the night, and blew, if anything, harder on the 16th, lowest bar pressure reached 28·402 in. (corrected) at 1 p.m. on 16th. From the 23rd to 26th the weather was fine and frosty, and from that date to the end of the month wet.

ABERDOVEY.—The rain fell chiefly in the nights, and the days were warm and bright. Prevailing wind westerly.

LLANDUDNO.—On the whole a fine month, and nearly 2° warmer than the average. The rainfall was about ·5 in above the average, but no heavy fall occurred, although for four days consecutively (16th to 19th), the bar. was below 29 inches, neither was there any corresponding force of wind.

## SCOTLAND.

CARGEN.—A wet and rather stormy month. Mean temp. 42°·9 about 3° above the average.

HAWICK.—A very mild February; pastures are greener than they were at the beginning of April last year. Lark first heard on 8th.

ARDDAROCH.—The month was generally stormy, with much R and very little sunshine.

KILMORY.—Although the rainfall was large, the greater part having fallen in the night, many observers would have called it a dry month.

BRAEMAR.—A wet, but very mild month.

PORTREE.—A wet, cold, and stormy month. Very strong gales on 17th and 26th, almost equal to that of December 28th, 1879. Frequent S and H showers.

CULLODEN.—The weather during the month was favourable for out-door work; little R and neither S nor fog; frosts generally slight and of short duration. Vegetation advanced in field and garden.

DUNROBIN.—Weather very mild and open.

SANDWICK.—Generally a mild pleasant month till 25th, but during the last 5 days we had either R or storm. On the 26th there was a gale of 62 miles an hour from 3 to 4 a.m., and 50 miles or more from 2 to 7 a.m.; and on 28th a gale of 60 miles or more from 4 to 9 a.m.; and it was even 70 miles from 6 to 7 a.m. There was also a gale of 50 to 60 miles from 8 p.m. on 16th to 2 a.m. on 17th.

## IRELAND.

WATERFORD.—Wind very violent on 6th and 13th. Bar. very low on 16th.

KILLALOE.—Fairly average weather for the month, for although R fell on more than the usual number of days, the quantity was not excessive. Heavy gales of wind on 14th and 15th. Mean temp. 43°·2.

WARINGSTOWN.—Bar. at 7 p.m. on 16th, corrected and reduced 28·339 in.

LONDONDERRY.—Prevailing winds S.W. and W.

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## THIRTY SUMMERS.

*To the Editor of the Meteorological Magazine.*

SIR,—In the month of May last year Mr. W. Lucas published a table in the magazine giving a record of the temperature of 30 years' winters. It would add very much to the interest taken in the subject if he would now publish the temperature of the correspond-30 years' summers.—Yours truly,

FRED. SLADE.

*Southbank Road, Kenilworth, March 11th*, 1880.

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HAILSTORM NEAR BRISBANE, QUEENSLAND.—It is sometimes doubted by people living in cold climates whether hailstones ever do penetrate through ordinary galvanised iron, as related by travellers. If any such sceptic had been present in Ipswich on the 18th November, 1879, his doubts would soon have been set at rest. Iron roofs were completely riddled by the hail; the School of Arts had every pane of glass broken; the Church of England School was blown down, a large part of the railway station was a complete wreck, and every building, every garden, every vineyard in the place has received damage to a very serious extent.—*The Colonies and India*, January 17th.

SYMONS'S

MONTHLY

# METEOROLOGICAL MAGAZINE.

CLXXI.] APRIL, 1880. [PRICE FOURPENCE. *or 5s. per ann. post free.*

## METEOROLOGY IN FRANCE.

WE fear that the above title is rather too large for the remarks which we are about to offer. Half-a-dozen numbers of this Magazine might be filled with descriptions of what is now being done for Meteorology in France. We cannot spare that amount of space, but, on the other hand, our readers ought to be made aware of the vigorous and systematic way in which the Bureau Central Météorologique has set to work. It was only established, on the recommendation of M. Bardoux, by the decree of Marshal MacMahon dated May 14th, 1878, and it was probably some time after that before Prof. Mascart was appointed director. Thus it is certainly far less than two years since the office was started. In our number for June, 1879 (page 73), we reviewed the first publication of the office, an octavo pamphlet of instructions for observers. Some months since we received the first quarto volume of the Annales of the Bureau,* and we commence the present article with a summary of its contents.

The introduction starts with a reprint of MacMahon's decree establishing the Bureau, and is followed by a few words from Prof. Mascart gracefully recognizing Le Verrier's services to Meteorology. These are followed by a list of the council appointed to advise with the director respecting the proceedings of the Bureau. The work of the office is then briefly noticed under three heads—Storm warnings, Climatology, and General Meteorology.

**Storm Warnings.**—This branch continues the *Bulletin International*, which was originated by Le Verrier, and is the model from which the English, and all other, Daily Weather Reports have been more or less copied. It also issues the storm warnings both for marine and agricultural purposes, the latter being developed to a remarkable extent, as there were at the date of the volume before us 580 communes, which subscribed the sum necessary to ensure the despatches being regularly telegraphed to them.

* *Annales du Bureau Central Météorologique de France. Année* 1878. *Etude des Orages en France et Mémoires divers.* Paris: GAUTHIER-VILLARS, 1879. 4to, xv.-162 pages, and 47 plates.

**Climatology.**—On this subject we translate Professor Mascart's own remarks :—"To ascertain the climate of France the assistance of a large number of observers is requisite. The regional or departmental commissions can render the greatest service by stimulating the zeal of the observers and by detailed study of each region, but their labours will only be of real utility when they are conducted upon uniform methods, at any rate as regards the more important phenomena. Nevertheless, before making any change in the existing organization it has appeared desirable to ascertain the state of the different commissions, the number and condition of the stations, their labours and their resources." A series of questions was therefore issued, the result being to show that there exist almost everywhere men who are ready and willing to further the progress of meteorological research, and only waiting for precise and uniform directions.

A long and carefully prepared circular was, therefore, drawn up and signed by the Minister of Public Instruction (M. Jules Ferry), and sent to all the Préfets, sketching out the composition, work, and resources of the commissions. We need not enter into the details, but, roughly speaking, the effect is to create a large number of small Meteorological Societies all over France, the presidents or delegates of which are invited to a general meeting in Paris once each year.

Similar steps have been taken in order to reorganize the observations made at the Normal Schools, and a very stringent circular was issued to the director of each school on April 23rd, 1879.

Upon the request of M. Lalanne, and with the consent of the Council of the Association Scientifique, the Minister of Public Works decreed that the grant hitherto made towards the cost of publishing the *Bulletin Météorologique de l'Association scientifique de France* should be transferred to the Bureau central météorologique, and, therefore, in future that office will print all the rain records kept by the Ponts et Chaussées, along with those from the Observatories, from the Normal schools, from private observers, and from the departmental commissions.

Lastly. Our readers are probably aware that Forestry, a subject which is entirely neglected in England, receives considerable attention in France, one of the Under Secretaries of State being "Directeur des Forêts," and having a large staff of foresters under his control. It is proposed that all these men shall be called upon to send in Natural History notes, or, as we call them in this country, records of phenological phenomena.

**General Meteorology.**—This section of the introduction appears to us to merit unabridged translation, as several of the points have never to our knowledge been more clearly expressed.

"Enquiries into the average distribution over the globe of the principal meteorological elements, such as pressure, temperature, cloud, wind, &c., will some day enable us to lay down the general laws of atmospheric phenomena, or the prevailing conditions during

each season, and to analyse their mechanical causes. Regarded from this purely scientific point of view, the study of general meteorology is of great importance, and we shall endeavour to assist in its advancement.

"On the other hand, weather forecasting, which may be considered to be the principal object of a meteorological service, is based on acquaintance with the phenomena indicated by each day's observations; but the existing state of the atmosphere alone is insufficient, and one must take into account the normal conditions, the dynamic equilibrium which would ordinarily prevail, and which reacts upon all accidental disturbances. Identical conditions may, therefore, according to the season of the year, lead to very different forecasts. Thus it is, that questions of general meteorology prove important even from a purely practical point of view. As to the disturbing phenomena, the squalls which so often pass over these regions, it is necessary to follow them uninterruptedly in order to ascertain their various phases and mode of propagation.

"We ought, then, to devote ourselves to the resumption of the study of the general movements of the atmosphere, and in order to profit by the progress already made, we have thought it well to base our researches upon simultaneous observations.

"The idea of simultaneous meteorological observations appears to be rather old. Without going back to Lamarck, who seems to have suggested observations of this class at the beginning of the century, Le Verrier had called attention to its great importance, and wrote in the Introduction to his *Atlas des mouvements généraux de* 1864, published in 1868, the following lines:—

"'At the commencement of such a work it would have been very difficult, if not impossible, to ensure that all the observations (on ships) were simultaneous. It is a feature much to be desired, but only to be secured in a time more or less remote, and it is of the highest importance that the maps should represent the state of the atmosphere over the ocean at the same instant of time, in order that one may follow the variations from day to day.'

"The realization of this project has been more prompt than Le Verrier hoped. In accordance with a proposal submitted by General Myer to the Vienna Congress in 1873, a very large number of Continental stations now observe at a single instant of absolute time, viz., at 0h. 53m. p.m. Paris mean time.

"But one observation per diem is scarcely sufficient to enable us to trace the development of a violent phenomenon, as is shown by M. Rollin's 'Memoir on the Storm of February 20th, 1879,' and we have proposed to add to the 0.53 p.m. observation, another six hours later. With the morning despatches, we should thus have three successive observations each day, and although night observations would still be wanting, we should nevertheless be able to study more closely the general movements of the atmosphere.

"But on account of the vast extent of the oceans it is evident

that observations at land stations alone will be insufficient, and that the assistance of mariners is necessary. The Government has made these observations compulsory on all the vessels of war crossing the Atlantic. Many of the steamship companies have recommended the same observations to the captains of their vessels, and we may hope that the whole mercantile marine, at any rate all sailing vessels, will afford us their valuable aid.

"Already the Chamber of Commerce at Havre has, at our request, made an annual grant in order to encourage these marine observations. Other Chambers of Commerce, to which we have not yet applied, will doubtless respond to our appeal with equal liberality, as indeed they did when Le Verrier requested their aid. Moreover, the Council of the Association Scientifique de France, desirous of continuing the encouragement which it has hitherto given to the development of meteorology in our country, has decided that a certain number of medals shall be distributed each year to the most zealous observers, and that an important proportion of these distinctions shall be awarded for observations made by merchant captains.

"Still, ships are moving observatories which vary little from regular tracks. Perhaps the time will come when the importance of meteorological studies will be considered sufficient to justify the despatch of vessels to cruise in important localities. At present we must do our best with all the fixed stations which it is possible to establish along the coasts and on the islands, where the numerous and intelligent staff at our consulates may render great service. And in order to obtain this aid, a circular was issued by M. Waddington to certain consuls on the shores of the Atlantic and of some of the European seas."

Then follows the address delivered at the first general meeting of the Council by its President, Hervé-Mangon. We regret that we can only spare space for a few paragraphs.

"For many years those savants who were interested in the meteorological service have desired to see it independent of the Astronomical Observatory. But it would neither have been just nor prudent to have taken from Le Verrier that international meteorological service which he had had the glory of creating in our country; but as soon as circumstances allowed, the re-organization of the service was carefully considered."

M. Hervé-Mangon then explains fully the steps taken to organize the present office, and to bring the stations throughout the country into accurate and harmonious working. The position of France with respect to the International Congresses is set forth as follows :—

"You are aware, gentlemen, that since the memorable Brussels Conference of 1853, France had not taken part in the International Meteorological Congresses, and that it was not represented at Vienna in 1873. It is useless to dwell on the causes of this state of things, which was as painful to French meteorologists as it was injurious to the progress of science itself; however, it was necessary in every

respect to terminate this unhappy isolation when our service was being re-organized. The Exposition of 1878 offered a favourable opportunity for entering into personal relations with the savants of other countries. With this object the Meteorological Society of France organized a free International Meteorological Congress. A large number of savants responded to its appeal. The meetings, both public and private, were most cordial. Some weeks afterwards M. Mascart was requested by our guests, as I had desired, to join the permanent committee charged with the *interim* questions respecting the international meteorological service, and with preparing for the approaching Congress at Rome.

"France, diplomatically invited, was represented at the Congress at Rome in April, 1879, and I am glad here publicly to thank the Italian meteorologists for the cordial welcome which they accorded to the French delegates. At the close of the Congress M. Mascart was re-elected a member of the permanent committee. French science has thus resumed in the international meteorological service the place which it ought naturally to hold."

After remarks upon internal arrangements respecting Weather Telegraphy, M. Hervé-Mangon proceeds to notice the question of American weather warnings; but (we hope accidentally) he omits all mention of what has been done by the *New York Herald*. He says:—

"We see, then, that it is beyond all things necessary to improve and to increase the area of international telegraphic despatches. We have reason to hope for great progress in this respect. France will doubtless soon receive a daily despatch from the United States Signal Office, which will be of great interest, both theoretical and practical; not only will it acquaint us with the atmospheric conditions prevailing over the vast area of the American Republic, but moreover it will enable us to trace exactly the route of the depressions which cross the ocean towards us, and which have so great an influence on our weather. The Signal Office receives immediately upon their arrival at New York copies of the observations made on board the Transatlantic steamers. Thanks to these documents, we can follow on the ocean, day by day, step by step, as one might say, the variations of the barometer and thermometer. It is then easy to ascertain whether a squall starting from the American coast, travels regularly towards France, wanders from the route, or becomes extinct, exhausted, in fact, by the length of its journey. If these valuable data were regularly sent to us, we should know for certain that a certain depression met some days since by a steamer close to Newfoundland had been, on previous days, observed by other vessels on the direct route for Havre or Bordeaux, and thence we might predict almost to an hour the time at which it would reach our shores. And, again, our relations with Africa, coupled with the American despatches, will, I am persuaded, in a few years enable us to furnish to mariners leaving our ports, most useful information as to the winds

prevailing over the ocean, to trace for them beforehand, as Maury suggested, their routes across the sea."

We must not stop to notice all the remarks in this report, but limit ourselves to two others.

M. Hervé-Mangon draws attention to the importance of absolutely true time being kept at all the stations provided with self-recording instruments, and suggests that they should have a special wire uniting them with the nearest astronomical observatory. We fear, from this suggestion, that the English plan of sending a time signal to every telegraph station in the country is not yet adopted in France. If it is not, the sooner our French friends copy the English plan the better; it is not often that we are ahead of them in matters semi-scientific and semi-official. If time signals have not been introduced, they should be at once; if they have been, the observatory clocks ought to suffice for the rest.

M. Hervé-Mangon is not only a Past-President of the Meteorological Society of France, but he is also well known as one of the leading authorities upon agricultural questions: this lends a special weight to the following remarks:—

"Lastly. I would express a desire which you all can fulfil, if, as I hope, you are willing to do so. I think that meteorologists too often neglect observations of animal or vegetable physiology. The dates of the arrival and departure of migratory birds, the leafing and flowering of plants, and the ripening of corn should be noted in each district. And, in the interests of agriculture, I would specially urge careful registration of the date of sowing and harvesting the principal crops, and of cutting the hay near the observatories. This would soon give for each department facts of considerable practical importance, for one could predict, more than a month beforehand, within two or three days, the date of the harvest, and furnish agriculturists with other data of equal utility. Even as a question of pure science, I will add that plants are invaluable instruments, the observation of which will furnish valuable information respecting slow climatic changes, which, up to the present time, we are far from possessing,"

The rest of the volume is composed of a series of beautifully illustrated memoirs upon the storms which passed over France during 1876 and 1877; and of articles on observations of temperature, by M. Edmond Becquerel; on the reduction of barometric readings to sea-level, by M. Angot; and on phenological phenomena and frosts in Sweden, by M. Hildebrandsson.

From one of the papers by M. Fron we extract the following account, by M. Legendre, of a whirlwind at Heiltz-le-Maurupt, 120 miles east of Paris:—

"I was in the hall of the Mairie when the storm of Feb. 20, 1876, broke. To the west of the town there appeared a storm, but not of a specially threatening character. I heard two peals of distant thunder; ten minutes afterwards, at 4.30 p.m., I heard a sudden and

extraordinary noise. I could not account for the nature of this noise, which sounded somewhat dry, like falling hail, or that of a great conflagration. I turned my head and saw fragments of all kinds carried obliquely in the air—tiles, slates, stones and wood—a frightful cloud. I thought that no building could resist it. To turn round and advance a few steps towards the door was the work of an instant, during which a shower of glass and slates burst into the hall. The windows were thrown on the floor, the chimneys fell, and walls were thrown down. A second had sufficed, and the tempest had passed. Then, looking through the windows, I could see the havoc produced: houses ruined, parts of walls thrown down, the entire roofs of other dwellings carried away, and the streets filled with fragments. A young girl had been buried under a mass of bricks, but was drawn out alive. The total loss in furniture and buildings was 150,000 francs (£6,000). The storm had begun about 150 yards from the first houses. The lightning did no harm, except within 15 or 20 yards on each side of a straight line. Some lime trees which had stood for centuries were broken. The parts of the walls thrown down are those facing east, although the storm came from the west. A low wall surrounding a garden had every stone thrown down. One solidly-built house presented a grievous appearance. A stone chimney pot had been carried 200 feet over the roofs of neighbouring houses. A large fir, broken off 6 feet above the ground, had been carried into a court-yard separated from the garden by lofty buildings."

We cannot stop to notice all the interesting features of this work; we must indicate a few, and pass on M. Olry gives, on page A 15, a very clear description of a waterspout; M. Hébert, on page A 29, gives a full account of the damage by floods in October, 1876, at Vicq, in Haute Vienne; and on page A 42 the same high authority is quoted in support of hailstones weighing 250 grammes (nearly nine ounces) having fallen on June 22nd, 1876. In June, 1877, M. Piche reports that hailstones which "averaged as large as a fist," fell at D'Asson, near the Pyrenees. In August, 1877, M. Lespiault reports hailstones as large as geese's eggs; and that at Beauregard, near Terrasson, two were found weighing respectively 500 grammes (1 lb. 2 oz.), and even 800 grammes (1 lb. 12 oz.). The same gentleman is responsible for the statement, on page B 24, that of certain strokes of lightning—"Enfin, une seule (coup de fondre) a atteint une personne le 19 juin sur le territoire de Serqueux près Bourbonne, et l'a dépouillée complétement de ses vêtements sans qu'aucune trace du passage du fluide électrique ait pu être remarquée."

*(To be continued.)*

## EASTER AT THE SORBONNE.

CONSIDERED as a gathering of scientific men, and as an occasion for the beneficial interchange of thought, the meeting of 1880 must be re-

garded as a success; but judged by the meteorological papers read, it was a failure. The only papers at all bearing on Meteorology were—

M. ALLUARD (director of the Meteorological Observatory on the Puy de Dôme). *On the Winter of* 1879-80 *at Clermont and on the Puy de Dôme.*—The leading feature of this paper was the great difference in temperature which had prevailed between Clermont and the station on the summit of the mountain, the higher station having been frequently, and greatly, warmer than the lower one. On one occasion the difference amounted to 36°·6. During two and a half months there were 51 nights on which it was warmer on the mountain than at its foot. There were two special features in the winter of 1879-80 at the lower station at Clermont—(1), the prevalence of fogs, which, owing to the dryness of the air and the distance of Clermont from any river, are usually very rare; (2), the severity of the frost, which, on December 6th, culminated in the temperature of —10°·3 F.

M. MASURE (member of the Horticultural Society of Orléans). *Observations on the Evaporation of Water, and on the Transpiration of Plants.*—This was a partly experimental, and partly theoretical, paper. The experiments had chiefly been made by very accurately determining the loss of water by weight. The author remarked that the evaporation from wet ground is greater than that from water; that even when air is only damp (say the humidity not above 80) moisture is often deposited on the earth; that it is certain that the consumption of water by plants is not wholly due to evaporation from their leaves; that the true amount of evaporation is at present badly determined, but that is really merely a question of the interchange of vapour between the clouds and the earth, dependent on their respective temperatures. This view the author developed in a formula, by which he said that the amount of evaporation could be computed from ordinary meteorological readings. But as we did not see that the velocity of the wind was included in the formula, we do not reproduce it.

M. NIEPCE. *On the Variations of the Climate of Nice during* 1878-79. —This could hardly be called a paper; it was really a meteorological chart for the two years, and was made the subject of a few remarks by M. Renou, the most important of which was, that to find a winter of equal intensity of cold to that of 1879-80 it was necessary to go back to 1820.

M. PAMARD (Vice-President of the Meteorological Commission of Vaucluse). *On the March of Cyclones: an Explanation of the Mistral.* —M. Pamard's paper has been printed, and we defer our report until we have had time to abstract the copy with which he has favoured us.

PROF. RAULIN. *On the Seasonal Distribution of Rainfall in Italy.*— Of this paper also we defer our notice.

GENERAL DE NANSOUTY, who is well known for his courageous persistence in his observations on the summit of the Pic du Midi, did

not read a paper; but, at the request of M. Jules Ferry, he gave a short verbal description of the past winter at that lofty station, where he said the weather was quite mild, for while Paris was under a deep bed of snow, he was gathering flowers on the mountain-top.

## THE METEOROLOGICAL SOCIETY.

THE usual monthly meeting of this Society was held on Wednesday, the 17th instant, at the Institution of Civil Engineers, Mr. G. J. Symons, F.R.S., president, in the chair. Sir A. P. Bruce Chichester, Bart., W. H. Cochrane, Rev. H. Garrett, M.A., H. Jonas, J. Lingwood, Lieut.-Col. L. W. Longstaff, Rev. C. E. Sherard, J. H. Stewart, and Dr. W. J. Treutler were balloted for and duly elected Fellows of the Society. The following papers were read:—1. "Thermometric Observations on Board the Cunard R.M.S.S. *Algeria*," by Capt. William Watson, F.M.S. 2. "On the Greenwich Sunshine Records, 1876-80," by William Ellis, F.R.A.S. At 8 p.m. the discussion was suspended in order to afford the Fellows an opportunity of inspecting a large number of new and interesting meteorological instruments which had been brought together for exhibition.

The following list of the objects exhibited will sufficiently indicate the great interest of the collection:—

| Reference Number. | Objects. | Exhibitors. |
|---|---|---|
| 1. | Hagemann's Anemometer ... ... ... | *The Cowl Committee of the Sanitary Institute.* |
| 2. | ,, ,, with dial removed to show mechanism ... ... | *The Cowl Committee of the Sanitary Institute.* |
| 3. | Station Barometer with metal scale ... | *Mr. P. Adie.* |
| 4. | Dines' Hygrometer, original pattern, for use with iced water ... ... ... | *Mr. Casella, F.M.S.* |
| 5&6. | Do. new pattern, for use with water or spirit ... ... ... | ,, |
| 7. | Sunshine recorder ... ... ... ... | ,, |
| 8. | Casella's Self-recording rain gauge ... | ,, |
| 9. | Bourdon's Thermograph ... ... ... | *Mr. Donkin.* |
| 10. | Sunshine recorder ... ... ... ... | *Mr. R. J. Lecky, F.M.S.* |
| 11. | Cloud reflector ... ... ... ... | *Rev. W. Clement Ley, F.M.S.* |
| 12. | Wild's wind gauge ... ... ... ... | *Mr. R. H. Scott, Sec. M.S.* |
| 13. | M.O. new Fishery Barometer with Kew corrections ... ... ... ... | ,, |
| 14. | Hermann and Pfister's Metallic Max. and Min. Thermometer ... ... ... | ,, |
| 15. | Lamont's Atmometer ... ... ... | ,, |
| 16. | Hagemann's Anemometer ... ... ... | ,, |
| 17. | Lowe's Hygrometer ... ... ... ... | ,, |
| 18. | Set of Sunshine cards ... ... ... | ,, |
| 19. | The Society's Album ... ... ... | *Mr. G. J. Symons, Pres. M.S.* |
| 20. | Redier's Barograph ... ... ... ... | ,, |
| 21. | An undescribed pattern of rain gauge ... | ,, |
| 22. | Map of, and 14 photographs of damage by, the Walmer whirlwind ... ... ... | ,, |
| 23. | Goddard's Cloud Mirror, from the Great Exhibition, 1851... ... ... ... | ,, |
| 24. | Barometer adjunct ... ... ... ... | *Mr. E. White Wallis, F.M.S.* |
| 25. | Copies of Schwabe's sunspot drawings ... | *Mr. G. M. Whipple, F.M.S.* |

## BARBADOS RAINFALL.

*To the Editor of the Meteorological Magazine.*

SIR,—In a letter, dated the 5th inst., from Barbados, I find the following :—

"We have had an extraordinary fall of rain for the month of January, averaging, from 219 stations, 11·13 inches of rain, which is 240 per cent. above the 25 years' average of 3·26 inches ; and our rainfall for last year was also very much in excess of the average, and was at times so heavy and continuous as to produce landslips and subsidences of the soil."

As this may be of some interest, I beg to enclose it.—Yours, &c.,

L. CASELLA.

*London, E.C., 31st March,* 1880.

## SMALL WHIRLWIND.

*To the Editor of the Meteorological Magazine.*

SIR,—My gardeners observed a very curious phenomenon at about 11.30 a.m. on Monday, March 30th. A whirlwind took up a bundle of straw, about 50 yards below where they were standing, and carried it over a beech tree on my lawn, about 60 ft. high ; but there was not the slightest disturbance in the air where they were standing. —I am, dear Sir, yours faithfully,

THOS. DEVAS.

*Mt. Ararat, Wimbledon, April 1st,* 1880.

## MARCH HOAR FROST.—THE RECORD OF —23° AT BLACKADDER.

*To the Editor of the Meteorological Magazine.*

SIR,—I do not remember so late in the season ever seeing such a hoar frost as we had this morning, the rime did not leave the trees until nearly midday ; they were just as beautiful as they were in the winter. As late as ten in the morning the upper sides of the branches were covered with hoar frost about half an inch thick ; when the sun broke through the fog the ice fell from the trees in great lumps ; we registered 25°, or 7 degrees of frost in the morning.

I observe in last month's Magazine, under heading, "The Frost of December," a statement that looks much like a mistake. The min. ther. at Blackadder, Berwickshire, —23°, that is 55 degrees of frost, I can hardly believe it.—I am sir, yours truly,

JOHN MATHISON.

*Addington, March 20th,* 1880.

[The record of —23° is not a misprint, and although excessively low for the British Isles, is so corroborated by other records from the district, and by the effect upon the plants in the immediate neighbourhood that we believe it to be approximately correct, by which we mean, that although there may be an error of 2° or 3° we do not think that it much, if at all, exceeds that amount. We believe that

full details respecting this and other low temperatures, with maps of the districts affected, will be given in the next number of the *Quarterly Journal of the Meteorological Society* and after it has been published we shall be glad to receive any criticisms upon it.—ED.]

## EXCESSIVE RAINFALL IN SKYE IN FEBRUARY.

*To the Editor of the Meteorological Magazine.*

SIR,—The month of February has been most eventful for rainfall, as you will see by the return for month enclosed.

The greatest falls in 24 hours were on 1st, 2·36 in.; 4th, 4·29; 6th, 4·98; 25th, 2·22; and on 29th, 3·25. There were only two days on which no rain fell, viz., 9th and 22nd. The month throughout has been very mild and free from frost. Only one morning slight frost, viz., on 15th; and two days cold and blustery with snow and hail showers. All kinds of stock have done well on hill pasture, and the grass in sheltered places has been growing nearly all the winter. Round the coast here, during the latter part of January and the first ten days of February, large takes of herring were got, nothing to come near it for the last 20 years.

The rainfall at Sligachan during the month of February as read during month amounted to :—Daily gauge, 25·58 in.; monthly gauge, 23·15 in.—I am, sir, yours most obedient,

J. F. BUTTERS.

*Sligachan Hotel, Skye, 1st March*, 1880.

## CLOUD PHOTOGRAPHY.

*To the Editor of the Meteorological Magazine.*

DEAR SIR,—Possibly because I am not a professed meteorologist, I feel some little surprise at Mr. Clement Ley's opinion* that cloud observations are principally valuable as giving information on the subject of atmospheric currents. Important as this branch of the subject undoubtedly is, I cannot but think that the study of the forms and characteristics of clouds must form a most important part of practical weather wisdom, though one which, I fear, scientific meteorologists too often leave to the shepherd and the fisherman. The difficulty of describing intelligibly such varied and indefinite forms, has no doubt greatly hindered the study, but this difficulty does not apply to pictorial representation. I am convinced that any one undertaking a systematic application of photography to the sky, in the same manner as it has been applied to the sun, would be largely rewarded.

It would be easy to devise a panoramic camera to depict the whole heavens on one plate, and with dry plates at hand the labour would not be excessive, as only unusual forms need be photographed. Of course, the register should run side by side with one of colour, altitude, wind, and all the ordinary meteorological data.—I am, &c.,

A FELLOW OF THE CHEMICAL SOCIETY.

* Meteorological Magazine, vol xiv. page 114.

## THE WEATHER IN MARCH.

The first week of the month was characterised by dull and rainy weather. A large depression had its centre between the Shetlands and the west coast of Norway from the 2nd to the 5th, followed by several more on the 6th, all moving across the extreme N. of Great Britain to Norway. On the 8th a general rise of the bar. occurred (and simultaneously a general change from rainy to very fine weather), and an anticyclone was formed over Sweden, pressure being high and uniform over the whole of W. Europe. Temperature during the same period was above the average for time of year everywhere; as much as 5° or 6° over the greater part of England, and 3° or 4° elsewhere. Rainfall also above the mean.

The weather during the next week, although foggy or hazy in the S. and S.E., was generally fine and very dry over England; cloudy and rather rainy in Scotland; dull and showery over the greater part of Ireland.

An uniform and slow decrease in pressure occurred on the 9th, but a sharp recovery took place in the N. on the following day, an area of high pressure being formed near the Shetlands. This area gradually shifted till its centre (30·7) was over S. Sweden and the Baltic on the 13th, and a brisk fall in its rear was reported next day; pressure over these islands meanwhile ranging from from 30·1 to 30·3.

Temperature a little above the mean everywhere, except in N.E. England. The maximum was as high as 63° at Strathfield Turgiss; 60° at Lowestoft, London, and Marlborough; and 59° at Barnstaple. Rainfall below mean over England, but 0·96 above it at Ardrossan; 0·66 in Isle of Man; and 0·56 at Glasgow. The wind was mostly E. or S.E., and light in force.

Dry, fine, and very bright weather prevailed over these islands from 15th to 22nd. An anticyclone lay over Norway and the North Sea on the 16th, 17th, and 18th, gradually spreading eastwards over Great Britain, until on the 22nd it embraced Scandinavia, the North Sea, and nearly the whole of these islands.

Temperature was slightly above the average over Ireland, and all the western parts of Great Britain, about the mean in S. England, and a few degrees below it elsewhere. The minimum was as low as 23° at Durham, Kelstern, and Shrewsbury on the 20th, 25° at Cambridge and Leicester, and 27° at several stations.

The anticyclone maintained itself in much the same position throughout the week (23rd–29th). On the 25th, however, it began gradually to disappear, but the change was arrested on the 27th by a rapid recovery of pressure in the N. of Scandinavia, which caused the anticyclone to spread out on its northern side and extend over the whole of these islands. On the 28th the area began to move slowly southward, and the bar. fell somewhat decidedly in the N., while light breezes from S. and S.W. set in. In the S., however, the bar. continued to rise gradually, with a continuance of light or moderate E. winds. On the 29th pressure became exceedingly uniform, and it was apparent, from the reports of the next day, that a gradual change was in progress. On the 30th the bar. was rising over Scandinavia, France, and the eastern coast of Great Britain, but fell slowly in the W. and N. Next day the mercury fell over the whole of W. Europe, and a large and deep depression appeared over the W. of Scotland. The change was slight over Scandinavia and N. Germany, but rapid on our N.W. coasts.

The changes in temperature from 23rd to the end of the month were, with the exception of the 25th and 29th, slight and irregular. Fog or mist was reported every day after the 23rd, the quantity on the 30th being very considerable. The weather cleared somewhat on the 31st. Rainfall was almost nil.

*Lowestoft.* H. E. M.

# SUPPLEMENTARY TABLE OF RAINFALL IN MARCH, 1880.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | ·92 | XI. | Corwen, Rhug ..... | 3·26 |
| ,, | Margate, Acol ..... | ... | ,, | Port Madoc ..... | 2·63 |
| ,, | Littlehampton ..... | ·90 | ,, | Douglas..... | 2·81 |
| ,, | St. Leonards ..... | ·68 | XII. | Carsphairn ... ..... | 3·33 |
| ,, | Hailsham ..... | ·50 | ,, | Melrose, Abbey Gate... | 2·63 |
| ,, | I. of W., St. Lawrence. | ·91 | XIV. | Glasgow, Queen's Park. | ... |
| ,, | Alton, Ashdell..... | ... | XV. | Islay, Gruinart School.. | 3·20 |
| III. | Great Missenden ..... | ·67 | XVI. | Cupar, Kemback..... | 2·20 |
| ,, | Winslow, Addington ... | 1·79 | ,, | Aberfeldy H.R.S. ..... | 3·08 |
| ,, | Oxford, Magdalen Col... | 1·15 | XVII. | Tomintoul..... | ·59 |
| ,, | Northampton ..... | 1·31 | ,, | Keith H.R.S. ..... ..... | ·89 |
| ,, | Cambridge, Merton Vil. | ·91 | ,, | Forres H.R.S. ..... | 1·14 |
| IV. | Harlow, Sheering ..... | 1·01 | XVIII. | Strome Ferry H.R.S.... | 2·50 |
| ,, | Diss ..... | ·64 | ,, | Auchnasheen H.R.S. ... | ... |
| ,, | Swaffham ..... | ·95 | ,, | Lochbroom ..... | 1·55 |
| ,, | Hindringham ..... | 1·22 | ,, | Tain, Springfield..... | ·91 |
| V. | Salisbury, Alderbury... | ·76 | ,, | Loch Shiel, Glenfinnan. | 6·36 |
| ,, | Calne, Compton Bassett | 1·96 | ,, | Dalwhinnie H.R.S..... | ... |
| ,, | Beaminster Vicarage ... | 1·75 | XIX. | Lairg H.R.S. ..... | 1·33 |
| ,, | Dartmoor, Princetown.. | ... | ,, | Altnabreac H.R.S. ..... | 1·15 |
| ,, | Langtree Wick ..... | 1·99 | ,, | Watten H.R.S. ..... | 1·44 |
| ,, | Lynmouth, Glenthorne. | 3·43 | XX. | Fermoy, Glenville ..... | 3·63 |
| ,, | St. Austell, Cosgarne... | 3·31 | ,, | Tralee, Castlemorris ... | 1·57 |
| ,, | Taunton ..... | 1·70 | ,, | Cahir, Tubrid ..... | 2·18 |
| VI. | Bristol, Ashleydown ... | 2·44 | ,, | Tipperary, Henry St.... | 2·44 |
| ,, | Ross ..... | 1·24 | ,, | Newcastle West ..... | 2·15 |
| ,, | Wem, Sansaw Hall..... | ·96 | ,, | Kilrush ..... | 2·28 |
| ,, | Cheadle, The Heath Ho. | 2·27 | ,, | Corofin ..... | 5·20 |
| ,, | Bickenhill Vicarage ... | 1·60 | XXI. | Kilkenny, Butler House | ... |
| VII. | Melton Mowbray ..... | 1·57 | ,, | Carlow, Browne's Hill.. | 4·11 |
| ,, | Horncastle, Bucknall ... | 1·92 | ,, | Kilsallaghan..... | ... |
| VIII. | Walton-on-the-Hill..... | 2·27 | ,, | Navan, Balrath ..... | 3·61 |
| ,, | Broughton-in-Furness .. | 3·20 | ,, | Athlone, Twyford ..... | 3·89 |
| IX. | Wakefield, Stanley Vic. | 2·31 | ,, | Mullingar, Belvedere ... | 3·63 |
| ,, | Ripon, Mickley ..... | 2·06 | XXII. | Ballinasloe ..... | ... |
| ,, | Scarborough..... | 1·89 | ,, | Clifden, Kylemore ..... | 6·16 |
| X. | Mickleton..... | 2·02 | ,, | Crossmolina, Enniscoe.. | 3·90 |
| ,, | Haltwhistle, Unthank.. | 1·04 | ,, | Carrick-on-Shannon ... | 1·95 |
| ,, | Shap, Copy Hill ..... | 2·79 | XXIII. | Dowra ..... | 2·03 |
| XI. | Llanfrechfa Grange ..... | 2·85 | ,, | Rockcorry..... | 2·11 |
| ,, | Llandovery ..... | 3·07 | ,, | Warrenpoint ..... | 3·44 |
| ,, | Solva ..... | 1·74 | ,, | Newtownards ..... | 1·88 |
| ,, | Castle Malgwyn ..... | 2·21 | ,, | Carnlough..... | ... |
| ,, | Rhayader, Nantgwillt.. | 3·62 | ,, | Bushmills ..... ..... | 1·57 |
| ,, | Carno, Tybritle ... ..... | 2·52 | ,, | Buncrana ..... | 1·98 |

# MARCH, 1880.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1860–5 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date. | Min. Deg. | Date. | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | Camden Square | ·79 | — 1·29 | ·31 | 31 | 5 | 62·6 | 26 | 28·7 | 28 | 4 | 17 |
| II. | | Maidstone (Hunton Court) | ·38 | — 1·78 | ·18 | 31 | 5 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss | ·94 | ... | ·39 | 31 | 5 | 64·3 | 26 | 22·3 | 29 | 8 | 20 |
| III. | | Hitchen | ·86 | — 1·31 | ·34 | 31 | 5 | 57·0 | 30 | 24·0 | 28 | 14 | ... |
| ,, | | Banbury | 1·44 | — ·76 | ·60 | 31 | 5 | 60·5 | 25 | 25·0 | 20 | 14 | ... |
| IV. | | Bury St. Edmunds (Culford) | ·98 | — 1·22 | ·42 | 31 | 5 | 61·0 | 31 | 25·0 | 19 | 13 | 19 |
| ,, | | Norwich (Cossey) | ·72 | — 1·63 | ·34 | 31 | 7 | 60·5 | 5 | 26·0 | 25 | 12 | 14 |
| V. | | Bridport | 1·33 | — 1·54 | ·44 | 31 | 8 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple | 1·73 | — 1·42 | ·46 | 31 | 15 | 66·0 | 31 | 33·0 | 29* | 0 | ... |
| ,, | | Bodmin | 2·85 | — ·90 | ·84 | 25 | 18 | 60·0 | 27 | 33·0 | 24 | 0 | 6 |
| VI. | | Cirencester | 2·09 | — ·51 | 1·15 | 2 | 6 | ... | ... | ... | ... | ... | ... |
| ,, | | Shifnal (Haughton Hall) | 1·11 | — ·83 | ·32 | 2 | 10 | 58·0 | 5 | 26·0 | 20‡ | 11 | 13 |
| ,, | | Tenbury (Orleton) | 1·52 | — ·90 | ·60 | 31 | 9 | 64·5 | 29 | 25·8 | 29 | 12 | 19 |
| VII. | | Leicester (Town Museum) | 1·42 | ... | ·64 | 31 | 7 | 61·2 | 29 | 24·8 | 20 | 6 | 25 |
| ,, | | Boston | 1·40 | — ·39 | ·63 | 31 | 8 | 62·0 | 29 | 28·0 | 20 | 5 | ... |
| ,, | | Grimsby (Killingholme) | 2·41 | ... | 1·11 | 2 | 11 | 56·0 | 5 | 30·0 | 20 | 1 | ... |
| ,, | | Mansfield | 2·30 | ... | ·96 | 31 | 8 | 59·6 | 29 | 26·6 | 20 | 9 | 14 |
| VIII. | | Manchester (Ardwick) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| IX. | | York | 2·58 | + ·59 | 1·06 | 31 | 10 | 69·0 | 4 | 27·0 | 24 | 4 | 6 |
| ,, | | Skipton (Arncliffe) | 4·22 | — ·59 | 1·16 | 31 | 12 | 58·0 | 28 | 26·0 | 18 | 13 | ... |
| X. | | North Shields | 1·64 | — ·71 | ·80 | 31 | 8 | 56·0 | 5 | 27·6 | 20 | 4 | 4 |
| ,, | | Borrowdale (Seathwaite) | 7·16 | — 6·24 | 2·05 | 31 | 11 | ... | ... | ... | ... | ... | ... |
| XI. | WALES. | Cardiff | 1·90 | ... | ·75 | 2 | 12 | 60·0 | 25 | 28·6 | 29 | 2 | ... |
| ,, | | Haverfordwest | 2·79 | — ·66 | ·76 | 15 | 14 | 56·2 | 30 | 27·8 | 28 | 6 | 15 |
| ,, | | Aberdovey | 1·10 | ... | ·32 | 12 | 9 | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno | 2·14 | — ·12 | ·79 | 1 | 6 | 59·5 | 25 | 31·7 | 24 | 1 | ... |
| XII. | SCOTLAND. | Cargen | 1·91 | — 1·19 | ·52 | 12 | 8 | 59·4 | 19 | 26·8 | 24 | 13 | ... |
| ,, | | Hawick (Silverbut Hall) | 1·62 | ... | ·43 | 31 | 9 | ... | ... | ... | ... | ... | ... |
| XIV. | | Douglas Castle (Newmains) | 2·58 | ... | ·66 | 12 | 9 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Long (Arddaroch) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Kilmory | 4·74 | ... | ·92 | 30 | 9 | ... | ... | 26·0 | 24 | 12 | ... |
| ,, | | Mull (Quinish) | 2·68 | ... | ·55 | 5 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | | Loch Leven | 2·50 | — ·32 | 1·10 | 13 | 7 | ... | ... | ... | ... | ... | ... |
| XVII. | | Arbroath | 2·11 | + ·07 | ·75 | 12 | 10 | 55·0 | 29 | 30·0 | 19§ | 2 | ... |
| ,, | | Braemar | 1·56 | — ·65 | ·76 | 11 | 10 | 59·6 | 19 | 11·0 | 25 | 20 | 29 |
| XVIII. | | Aberdeen (Rose Street) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Portree | 3·22 | — 5·82 | 1·07 | 5 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | | Inverness (Culloden) | 1·32 | — ·64 | ·55 | 13 | 7 | 55·0 | 29* | 26·5 | 27 | 11 | 23 |
| XIX. | | Dunrobin | 1·61 | — 1·01 | ·67 | 12 | 8 | 56·0 | 29 | 29·0 | 3 | 8 | ... |
| ,, | | Sandwick | 2·91 | — ·42 | 1·25 | 12 | 10 | 50·2 | 8,18 | 33·3 | 19 | 0 | 9 |
| XX. | IRELAND. | Cork | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Darrynane Abbey | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Waterford | 4·46 | + 1·57 | 1·09 | 16 | 17 | 57·0 | 3 | 30·0 | 30 | 3 | ... |
| ,, | | Killaloe | 4·91 | + ·59 | 1·78 | 1 | 14 | 68·0 | 29 | 27·0 | 23 | 5 | ... |
| XXI. | | Portarlington | 3·84 | + ·53 | ·86 | 2 | 20 | 59·5 | 21 | 29·5 | 23 | 7 | ... |
| ,, | | Monkstown | 3·29 | + ·71 | 1·13 | 2 | 15 | ... | ... | ... | ... | ... | ... |
| XXII. | | Galway | 3·32 | ... | 1·31 | 1 | 17 | 61·0 | 21† | 30·0 | 23 | 3 | ... |
| XXIII | | Waringstown | 2·24 | ... | ·65 | 11 | 11 | 61·0 | 29 | 28·0 | 27 | 8 | 14 |
| ,, | | Londonderry | 1·99 | ... | ·59 | 4 | 14 | 59·5 | 20 | 31·8 | 23 | 1 | 13 |
| ,, | | Edenfel (Omagh) | 2·56 | ... | ·67 | 4 | 17 | 60·0 | 27 | 28·0 | 8 | 11 | ... |

* And 30. † And 22. ‡ And 29. § And 20.

\+ Shows that the fall was above the average; — that it was below it.

# METEOROLOGICAL NOTES ON MARCH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—A fine dry blusterous month, but cold at night; generally very favourable for agricultural work. First plover seen on 3rd; Mercurialis perennis in flower on 4th, Tussilago farfara in flower on 5th; first honey bee seen on 9th, first wasp on 10th, and first humble bee on 13th; wood anemone in flower on 11th, horse chestnut in leaf on 14th, Lamium album in flower on 21st.

BANBURY.—High winds on 1st, 2nd, 3rd, 5th and 8th. Slight fog on 20th.

CULFORD.—The month was distinguished by drought and a prevalence of cold east winds. Rather high S.W. wind on the first four days, Mean temp. 39°·7. T on 9th, hoar frost on 10th. Heavy fog on 12th and 14th.

BODMIN.—A very genial month. Mean temp. 47°·9

CIRENCESTER.—Stormy with heavy rain on 2nd, followed by a long continuance of fine weather. Prevailing wind S.E.

SHIFNAL.—The month came in in its true character. Violent wind from S.W. with R and H S or sleet till the 5th. On the 8th the wind changed to E. and S.E. with bright sun and frost; it continued from this quarter with slight rain at times till the close. Thick fogs in the mornings from 10th to 16th, clearing into bright sunshine. Hard frost with ice on nights of 19th and 28th. Clouds of dust; fine time for farmers to clear their ground and get in their barley. Rooks busy; and gooseberry buds bursting on 3rd. Yellow tipped humble bee out on 8th. Willow opening and celandine flowers on 22nd. Chiff chaff arrived on 26th, hawthorn buds bursting on 27th. First white butterfly seen on 30th.

ORLETON.—A very fine month for agricultural work with drying wind and much sun. The first twelve days were warmer than the average, but on the 13th the wind changed to N. and E. with frosty nights and sunny days and a lower temp., but no rain fell from the 12th to the 29th. The mean temp. of the month was very near the average. The max. and min. occurred on the same day, the 29th. The bar. was generally high and steady with a prevalence of easterly wind. On the 2nd the wind was very great from S.S.W.

LEICESTER.—Fog on mornings of 14th, 20th, and 23rd, and on evening of 13th; hoar frost on morning of 20th.

BOSTON.—March was a very fine month with drying winds, and during the last half of the month very little rainfall. The weather was generally very favourable for preparing the land for sowing spring corn. The temp. was about 2° above the average and the rainfall a little below. On the 2nd there was a slight fall of S. and during the night a violent storm accompanied by T. The thorn hedges began to burst into leaf about the middle of the month, and primroses and violets came into flower in sheltered places about the same time.

KILLINGHOLME.—Another month of seasonable weather though often very cold; easterly winds prevailing during the greater part. R on the first few days, and on the last day; the rest of the month very dry. Yews shedding pollen, and wild violets plentiful on 6th. Frogs spawning on 10th.

MANSFIELD.—S on 2nd. TS at 2 a.m. on 3rd. Hoar frost on 8th and 13th. Fog on seven days.

ARNCLIFFE.—An unusual prevalence of E. and S.E. wind.

SEATHWAITE.—I do not remember such weather in March for 20 years. Clear and cloudless with frost at night about the 16th. Glorious weather with frost at night about the 27th. The weather turned cold on 31st.

## WALES.

HAVERFORDWEST.—The month commenced very rough and cold; terrific squalls with H during the evening of the 1st. The stormy weather lasted till the 6th, after which it became milder. From the 14th to 16th it was again cold, with some heavy rain and strong E. winds, but after the 16th the weather

was remarkably fine and bright, with sharp frosts at night, the min. on grass being as low as 20° on the 24th. On the 28th the wind suddenly veered from E.S.E. to N.W., and there was a dense fog all night. At 8 a.m. on the 29th the temp. was only 27°·9; the day was fine, but the wind changed to S.W., and the month closed with a heavy fall of R and milder air.

ABERDOVEY.—First half of month wind westerly; second half prevailing wind easterly.

LLANDUDNO.—The first two days were stormy, but with this exception March was a remarkably fine month, and characterized by a large amount of sunshine. The mean temp. was 4° above the average, and the rainfall just about the average, but the greater part of it fell on the 1st, 2nd, and 31st. Only one night's frost. H and sleet on 1st; S on hills. S in night on 2nd.

## SCOTLAND.

CARGEN.—A fine month; 178 hours of sunshine, as compared with an average of 137. Sharp frosts at night between 17th and 28th. Mean temp. of month 2° above average.

HAWICK.—Farmers have scarcely ever had more favourable weather for seed sowing, but pastures are not so green as they were three weeks ago. A good shower would be acceptable, and would give an impulse to vegetation. S, sleet, and R on 1st and 2nd; S 3 in. deep on ground on 3rd.

DOUGLAS CASTLE.—Thunder about 1 a.m. on 2nd.

QUINISH.—A fine month on the whole, neither cold nor very wet.

BRAEMAR.—A dry but cold month, very favourable for seed operations.

PORTREE.—First ten days cold and squally with H and S, then strong sun by day and severe frosts at night till 28th, and wet and cold to end of month.

CULLODEN.—Month fine from the 13th to the close; weather very dry.

SANDWICK.—The weather in March was generally uncommonly fine, more like summer than spring, though the rainfall was slightly greater than the mean of the previous 39 years, and the fall on the 12th was greater than any fall since September 26th, 1875. There was a gale of 50 to 55 miles an hour on the 2nd and 3rd, and another on 31st, which at the strongest was about 60 miles an hour. Auroræ on 14th and 17th. March dust was abundant in the latter part of the month, so that farmers got a quantity of seed sown. A striking contrast to March last year, when the ground was under snow for a great part of the time.

## IRELAND.

MONKSTOWN.—The month commenced with heavy showers of sleet, H and S with heavy squalls. This was followed by milder showery weather till the 16th, from which date to the 25th the days were fine and bright, with cold easterly wind and frequent frosts at night; the remainder of the month was warmer and moister, the last two or three days being almost like summer.

LONDONDERRY.—On the whole a very mild and genial month. Wind principally southerly.

## A DRY PERIOD.

*To the Editor of the Meteorological Magazine.*

SIR,—As the last six months have been the driest I have ever recorded, I thought you might like a copy of my register.

| | | |
|---|---|---|
| 1879. | October ..... | ·660 in. |
| ,, | November ..... | 1·375 ,, |
| ,, | December ..... | ·570 ,, |
| 1880. | January ..... | ·095 ,, |
| ,, | February ..... | 1·275 ,, |
| ,, | March ..... | ·750 ,, |
| | | 4·725 in. |

—Yours truly, JOHN BYNG.

*Boxford Rectory, Colchester, April 1st*, 1880.

SYMONS'S

MONTHLY

# METEOROLOGICAL MAGAZINE.

CLXXII.] MAY, 1880. [PRICE FOURPENCE. or 5s. per ann. post free.

## METEOROLOGY AND ART.

*"De gustibus non est disputandum."*

WE do not often start off with a motto, but in artistic matters differences of opinion are so usual, that we neither request nor expect our readers to agree with the whole of the following article; nor do we for one moment assume that our opinions are correct. But we do assert most positively (1), that our criticisms will be entirely unbiassed as regards the artists, and (2), that our sole object is the promotion of Artistic Meteorology.

We have recently had communications respecting the photographing of clouds, and in *Modern Meteorology* and elsewhere attempts have been made to obtain accurate representations of them. It has occurred to us that amid the thousands of new pictures annually exhibited in London and Paris some good specimens should surely be found. We have therefore gone with some care through the collection in Burlington House, popularly known as the "Academy," and the corresponding exhibition in the Palais des Champs-Elysées, equally popularly known as the "Salon."

As it is courteous to give priority to strangers, and as the French Exhibition was opened a day or two before the English one, we will take the Salon first. Two preliminary remarks may be expedient. There are 7,289 exhibits, and if we deduct 1,000 for sculptures and 289 for engravings, we have 6,000 left, of which very nearly half contain representations of portions of the sky. We need not say that it is beyond our scope to critically consider 3,000 representations of atmospheric conditions.

Another general remark. The Salon indicates the prevalent weather in France during the previous season; snow scenes meet us in all directions.

But to business. We will not give the artists' names, because we are concerned with the accurate representation of the sky, no matter by whom it is attempted.

296 *Charmeuse d'oiseaux.*—Sea and sky of equally intense blue, without a trace of separating line or variation in tint.

484 *Avant l'Orage; soleil couchant en mer.*—Queer sort of sky; the coming storm must have been remarkable.

485 *La neige; Artois.*—Very good leaden, snow-laden sky.
(The same remark applies to the following numbers, which need not be further specified: 1,665, 2,935, 2,948.)

487 *Le soir.*—Sun too pale.

591 *Avant la pluie.—Automne.*—Good blue sky at the top, then rounded cumuli, running into nimbi below.

778 *Un mauvais temps.*—A heavy shower; the rain good, but falling from a cumulus instead of a nimbus.

820 *Messe des morts dans les Morbihan.*—Good strip of cirro-cumulus, but the moon far too faint.

902 *L'orage.*—The only indications of a storm are a little darkness, and an impossible flash of artists' lightning.

917 *Le soir au bord de la mer.*—General effect good, but the sun has set in two or three places.

1210 *Le crépuscule.*—Upper sky very green.

1211 *Souvenir de Loch Carron (Ecosse).*—Grand effect of mist rolling over the mountains.

1338 *Au matin.*—Good rosy sunrise.

1484 *Falaises du Bourg d'Ault.*—Coffee-coloured clouds over a motley blue.

1500 *Caravanne de la Mecque au Caire.*—Fine oriental sky, with very small faint cirro cumuli.

1571 *Village danois* (marked on the frame *L'Hiver en Suède*).—A very queer sky, the centre bright sulphur, surrounded by whitey-brown, and with rose-tinted fragments near the zenith.

1683 *Bords de l'Oise.*—Cirro cumuli arranged in symmetrical ovals round the sun.

1749 *La ville de Vezelay (Yonne).*—Uniform blue sky whitened by vapour, one fragment of fleecy cirrus floating along, and the town on a hill cut sharply against the sky. The shadows of the trees seem to fall in very different directions, but that is not a meteorological point.

1791 *Un potager aux environs de Quillebœuf (Eure).*—Fleecy clouds passing over the moon; but the moon too white, and the garden too dark.

1795 *Retour du chasse; effet de soir.*—We should not like to have been there, for instead of clouds there seem to be large rocks or meteoric masses falling out of the sky.

1889 *Un soir d'orage.*—Edges too regular and round, otherwise good.

2005 *Un jour sombre en Norvége.*—True Norse sky.

2115 *Le "Luisant"; côte de Granville (Manche).*—Nimbi in front of cumuli, but the edges of the cumuli curved the wrong way.

2169 *L'Anse des Kourigans, pres Lorient.*—Fine sea sky.

2333 *Claire de lune; hiver.*—The only indication of moonlight is an orange-coloured round disc, with nothing but nimbus and stratus, and yet a corona.

2377 *Les champs, à Anvers (Oise).*—A little hard, but good cirro-stratus and nimbus.

2924 *Les premières feuilles.*—A leaden sky with a long horizontal crack filled with greenish yellow.

3150 *Fin d'automne; vallée de Chevreuse.*—Good effect of mist and a good stratus, but a stroke of white above which represents (?).

3195 *Pêcheuse de moules, à Berneval; côte Normande.*—A wonderful sky, it looks as if it were made of mother of pearl!

3490 *L'embâcle de la Loire à Villebrenier; fevrier* 1880.—Fine frost tints running from slate to rose on the horizon.

3739 *Soir d'été.*—Good rosy cumulus.

3790 *L'embouchure de l'Escault.*—Too much coffee colour.

3816 *Graziella.*—Green sky.

3930 *Le convent des Arméniens à Venise; effet du soir.*—Good fleecy cirro-cumulus, but sky round setting sun, too brown.

3937 *Isle-les-Villenoy; bords de la Marne.*—The sky blue, white, and grey, like a cheap wall paper.

The Academy Exhibition only contains a total of 1512 exhibits, including architecture and miniatures—say 1300 paintings against the 6000 in the Salon—and it contains few or no such meteorological impossibilities as are to be found in the Champs-Elysées. But we proceed with our notes —

24 *Cornfield; Towyn N. Wales.*—Sky too white.
38 *Night; Scheveningen.*—Outlines good, but colour too green.
51 *On Borth Beach.*—Magnificent cumuli.
118 *Sunrise from Waterloo Bridge.*—Faint cirri, good but unimportant.
139 *Evangeline.*—Sky nearly as green as the field.
142 *Sister's Kiss.*—Undescribed form of cloud.
208 *Blushing Morn.*—This picture, though "skyed" by the hanging committee, seems to us very truthful.
387 *Britannia's Realm.*—Fine cumuli and a few cirri over an exquisite sea.
427 *The Fen at Sunset.*—The only English picture containing the unnatural coffee colour, of which there are three or four specimens in the Salon.
429 *Buckhaven, Fifeshire.*—Too green.
524 *Exmouth from the Warren.*—Good cumuli and cirri.
535 *King Arthur's Castle, Tintagel.*—Glorious as are often the sky tints in this part of Cornwall, we never saw so green a sky as is here represented.
645 *Vanderdecken.*—Being an imaginary picture, this is perhaps exempt from criticism.
652 *The lingering mists of morning.*—Truthfully rendered.
669 *Sandy shallows of the sea-shore.*—Good cumuli with streams of light through the rifts, but these streams are parallel.
973 *The beachèd margent of the sea.*—Very fine cumuli and cirro cumuli.
994 *The morn in russet mantle clad.*—The contrast between land and sky is too great, the sky too white.
999 "*Make haste to save the hay, for rain will shortly come.*"—We do not think that the labourers need hurry, for the signs of coming rain are not very obvious.

## THE METEOROLOGICAL SOCIETY.

The ordinary meeting of this society was held at the Institution of Civil Engineers on Wednesday the 21st ult., Mr. G. J. Symons, F.R.S., President, in the chair. Rev. J. O. Bevan, M.A., F. E. Cobb, E. Filliter, C.E., F.G.S., T. L. Gentles, W. A. Harrison, F.R.G.S., J. W. Peggs, C.E., F. Slade, C.E., and E. J. C. Smith were elected Fellows of the Society.

The discussion on the paper by William Ellis, F.R.A.S., F.M.S., "On the Greenwich Sunshine Records 1876-80," was resumed and concluded; after which a paper was read by G. M. Whipple, B.Sc., F.R.A.S., F.M.S., "On the rate at which Barometric changes traverse the British Isles." The chief results at which the author arrived are as follows:—

1. That the average rate of motion of barometric changes in their progress across the British Isles is about 53 miles per hour.
2. That the mean rate does not vary to any considerable extent from year to year.

3. That the crests travel with somewhat greater velocity than the hollows, hence the character of the movement changes as it passes across the country.
4. That the rate of motion is slightly diminished as the wave passes northward.

A paper was then read by J. W. Zambra, F.M.S., on a new form of Six's self-registering thermometer.

This instrument is an ordinary Six's thermometer, with a tube in continuation of the top bulb; to this tube is attached a reservoir similar in size to the bulb; this reservoir contains mercury, and the continuous tube is made to dip into it, forming a mercury joint. There is also a contrivance to prevent the mercury being forced back into the alcohol; and the reservoir has a small opening to the atmosphere near the top. Thus arranged, the spirit in the thermometer is under the ordinary pressure of the atmosphere, and evaporation is cut off by the intervention of mercury.

These thermometers have been in constant use during the late excessively cold weather and have remained perfect.

It also appears from observation that the column of mercury is more consolidated under this equal pressure, and moves more uniformly, than it does under *confined varying* pressure. In the ordinary instrument the mercury does not always move freely, but hangs in the tube, resulting in the two columns, maximum and minimum, not always indicating exactly the same temperature.

There are various forms in which the improvement can be carried out, all involving the same principle, either of which can be applied to the ordinary Six's thermometers now in use.

## THE WEATHER IN APRIL.

April opened with weather much less settled than that which prevailed during the greater part of March, the sky being for the most part cloudy or dull, and heavy showers of rain (and, at some places, hail) fell frequently. The bar. was low over these islands generally, from the 1st to 7th. Temp. was a degree or two above the mean everywhere. Rainfall above average in all districts; particularly so in N.E. and S.W. of England. Bright sunshine was much more continuous in the western than the eastern parts of this kingdom, but nowhere was the sun visible during even half the time that he was above the horizon. The recorded duration varied from 43 hours in the Midland Counties, and 40 hours in Ireland, to 19 hours in N.E. England. Wind was generally S.W. in direction, and moderate in force in E. and S.E. England, but fresh or strong in the west and north.

The weather during the next week was generally cloudy, with frequent, but slight showers. Thunderstorms occurred over central and eastern England on 6th and 7th, and showers of hail fell at many places on both these days.

Atmospheric pressure, which, owing to the passage of numerous depressions across these islands, had been low since the beginning of the month, steadily increased on the 8th and 9th, but on the 10th a fresh decrease began, continuing on the 11th, the area of highest pressure being transferred from over these islands to Scandinavia, while the lowest readings were reported from the south of France. The fall of the bar. continued on the 12th, while it rose in the west and north, and shallow depressions were over the Bay of Biscay and northern Italy.

Temp. was about the mean in Scotland, but below it elsewhere. The

greatest deficit was 5°·2 at Shrewsbury, 5°·1 at Cirencester, and 4°·9 at Oscott (near Birmingham), and the smallest deficit 0°·8 at Barnstaple, and 0°·9 at Donaghadee. Rainfall was rather less than the average everywhere. The maximum duration of bright sunshine during the week (5th–12th) was 48 hours at Dublin and Valentia, and 45 hours in the Isle of Man; the former being 52 per cent. of the "total possible duration," and the latter 48 per cent.

The first day or two of the following week (12th–19th) were very rainy and unsettled, but by the 17th the weather had become fine generally, and continued so, with little exception, to the end of the week. Thunderstorms, accompanied by hail, were experienced over the Channel, except on the 14th, and at Hastings, Dover, and Yarmouth on 15th.

The bar. continued to fall everywhere at the beginning of this week, pressure becoming very uniform. On the 14th a large depression was shewn over the south-east part of Western Europe, which by 8 a.m. on the 15th reached Jersey, and at 6 p.m. of the same day was to the westward of the Scilly Islands. Turning at this point the depression took a northerly course, and occupied the whole of Ireland on the 15th. From the charts of the following day it appeared that the depression had travelled away westwards, but on the 18th a large depression appeared in the west, travelling in a northerly direction. On the same day a small depression was shewn in the neighbourhood of Hamburg.

Temp. about equal to the mean in Scotland and S. and E. England, but slightly below it in all other parts of the kingdom. The maxima were 69° at Cambridge, 67° at London, and 65° at Nottingham and Loughborough. Rainfall more than the average everywhere, with the exception of N.W. England. There was a slight increase in bright sunshine over the greater part of England, but a decided decrease in Scotland and Ireland. The duration ranged from 43 hours at Valentia, and 31 hours at Pembroke, to 17 hours at Dublin, and 15 hours at Cirencester.

Fine and bright weather characterized the next seven days; thunderstorms, however, were experienced at some inland towns in Great Britain, on the 21st and 25th, and very heavy falls of rain were reported from Scotland and Ireland on 21st.

On the 21st a large depression advanced from the Atlantic to our N.W. coasts, and travelled away in a north-eastward direction, immediately succeeded by another of lesser dimensions. The larger was shewn over Norway on 22nd, and the smaller in the vicinity of Aberdeen. When these depressions had moved away, the mercury rose over these islands and their neighbourhood, whilst it fell over S. France and the Baltic; readings becoming highest off our S.W. coasts, and lowest over N. Sweden. Pressure, after changing considerably and irregularly on the 24th, 25th, and 26th, rose generally over W. Europe on the 27th, and an area of high pressure, in which readings exceeded 30·4 in., was developed over N. Ireland, causing rather steep gradients over France and in the Channel. This was followed on the 28th by a fall of the bar. over the whole of these islands and neighbourhood, but the change in the general distribution of pressure was only slight, the area of high pressure being still in the same position. In Scandinavia the mercury rose, and the depression, which had travelled away from our N.W. coasts (above-mentioned) to Norway, apparently moved away eastward. Next day (29th) the bar. rose over the whole of W. Europe, the change being greatest in Scandinavia. The area of highest readings was now shifted to over Scotland, while the low readings were still reported from France. On the 30th, the area of high readings (30·5 in.) lay over Ireland and N. England, the bar. falling in N. Sweden and S.E. France, and rising elsewhere.

Temp. from 19th to 26th was about the mean in E. Scotland, N.E. England, and E. England, but a little below it in all other districts. The maximum (66° at Oxford and Nottingham) was registered on the 20th, and the minimum on the 23rd or 26th. Temp. during the last four days of the month was low for time of year.

*Lowestoft.* H. E. M.

## CLOUD PHOTOGRAPHY.

*To the Editor of the Meteorological Magazine.*

SIR,—To one who is, on any subject, an enthusiast, there are few things more agreeable than the finding of a greater enthusiast on the same subject. It is accordingly a pleasure to me to find that "a Fellow of the Chemical Society" appears to consider that I have as yet insufficiently insisted on the importance of "the study of the forms and characteristics of clouds" in its bearing on "practical weather wisdom."

To avoid misunderstanding, however, I may be permitted to repeat here the substance of what I have said in "Clouds and Weather Signs," in *Modern Meteorology*, pp. 110—136. It is through the information which the cloud forms give us on the systems of atmospheric currents, their character, distribution, and directions of development, that the study of the clouds is of utility for the prognostication of weather. One who ignores this method of inquiry had better, in my opinion, give up the task of forecasting weather, and cling closely to his umbrella in lieu of it. The rules of "practical weather wisdom," which are not based on the science of winds, may be advantageously left—and they form but a poor bequest—to "the shepherd and the fisherman."

With the principal point in the letter of "a Fellow of the Chemical Society," I, in the main, cordially agree. The panoramic camera will be a useful boon, and even without it photographs of the clouds are a most valuable addition to a meteorological register. Cloud Photography has before it, I believe, an important future. But let us be clear about our object, for it would be easy to obtain a series of photographs of "unusual" cloud forms, which, while interesting from an artistic point of view, might yet prove, meteorologically speaking, worthless.

There are, I think, three directions in which weather science is capable of great development. First in importance of promise is the investigation of anomalies in the great seasonal changes of weather over the most extensive area of the globe available, and of the relations which such anomalies may bear to periodical variations of solar activity; an investigation which may eventually lead to the possibility of predicting the general character of the weather over considerable areas for some months or even years in advance.

Secondly, and in partial connection with the above, a more thorough understanding of the causes which determine the courses of local cyclones and anti-cyclones will eventually lead to a great increase of precision in the prognostication of weather changes of short period and over limited areas.

Thirdly, we may yet more confidently assert that, subsidiary to and supplementary of the work of the meteorologist, there will ever remain the task of the local observer. The latter does and will continue to do a good deal more than supply the raw material for

the meteorologist. Many atmospheric conditions are too complex and subject to variations of too local a character to be completely indicated by any system of weather-charts. In reference to these conditions the study of the forms and movements of the clouds is most important, and to communicate the results of this study, cloud photography will prove highly useful. But it will have to be borne in mind that photographs, to be capable of being thus employed, should show us the most typical cloud-forms, by which I mean the forms indicative of special relations of upper and under currents, of changes of pressure, temperature, and humidity of the atmosphere. Most valuable, in the education of the observer, would be, *e.g.*, a well-selected series of photographs exhibiting the most typical varieties of cloud-forms in the centre, in the front and rear, right and left hand segments of cyclonic and anti-cyclonic systems, travelling in different directions, at different seasons of the year, and over diverse parts of the earth's surface.

The truly exquisite cloud photographs by M. Henri Osti, of Upsala, which Professor Hildebrandsson has given us, both show what has been done, and suggest what has not yet been done, by cloud photography. To the adept at weather-watching a few of these photographs convey a marvellously perfect impression of the weather conditions prevailing at the time and place where they were taken, but only a few of these are, in the strict sense of the word, typical.

Yours truly,

W. CLEMENT LEY.

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*To the Editor of the Meteorological Magazine.*

SIR,—Will you allow me to differ from your correspondent, "A Fellow of the Chemical Society," who says in last month's magazine that "It would be easy to devise a panoramic camera to depict the whole heavens on one plate, &c."

I think the problem alone of constructing a lense capable of performing such a feat as that suggested in the above sentence has yet to be solved.

Steps, however, have been taken towards obtaining photographic records of the forms, height, and motion of clouds, and in 1878 an instrument was devised for the purpose by Professor Stokes, F.R.S., and Mr. F. Galton, F.R.S., which, under the name of photo-nephoscope, has since been experimentally employed at this Observatory.

Capt. Abney, F.R.S., has recently introduced some very important modifications into the instrument, and we hope, as soon as he has completed the preliminary trials now in progress, to continue by its aid the experiments we are carrying out on behalf of the Meteorological Council for the extension of our knowledge of cloud variations.

G. M. WHIPPLE.

*Kew Observatory, May*, 1880.

## THE COMING SUMMER.

*To the Editor of the Meteorological Magazine.*

SIR,—According to a lunar law of the weather, to which I have frequently called attention,* a wave of unusually great heat should pass over this part of England in the last fortnight or three weeks of June next. July, also, for other reasons, ought to have a high mean temperature. In June there will be a similar occurrence of exceptionally uniform apparent movements of the lunar positions in the heavens to those which happened in August, 1842, the end of July and beginning of August, 1846, May, 1848, June, 1849, July, 1852, June, 1857, June, 1858, July, 1859, July, 1868, July, 1872, and the end of June and July, 1876; in all of which cases very great heat, or remarkably fine, warm, summer weather occurred.

There is, I know full well, a large amount of scepticism concerning the alleged influence of the moon on the weather. *I* was once a very obstinate sceptic on the subject, but, at last, was convinced against my will. Next June will furnish an excellent opportunity for testing the value of my lunar theory. As far as I know, it has always proved correct with regard to summer heat. Allow me, then, to ask your readers, especially the numerous sceptical ones, to carefully watch the weather of next June. If, as I believe, very great heat occurs then, let them candidly and honestly own that there must be something in the theory after all. If, however, contrary to my confident expectations, the heat does not occur, I will readily admit that the theory is not to be depended upon. I only ask for fair play.

Yours, &c.,

GEORGE D. BRUMHAM.

*Barnsbury, April 30th*, 1880.

* *Met. Mag.*, Vol. III., p. 104.

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## A DRY PERIOD.

*To the Editor of the Meteorological Magazine.*

SIR,—I send you a statement of the rainfall here during the past six months, compared with that of previous years, since I began to take an account of it. It seems a remarkable falling off. I don't know if it is general throughout the country, or peculiar to this district.

| | | |
|---|---|---|
| Rainfall in October, November, December, 1879—January, February, March, 1880 ... ... ... ... | 9·83 | inches. |
| Average rainfall for 7 previous years ... ... ... | 19·79 | ,, |
| Rainfall for October, November, December last ... | 4·54 | ,, |
| Average for 7 years ... ... ... .. ... | 12·00 | ,, |
| Rainfall for January, February, March last ... ... | 5·29 | ,, |
| Average for 8 years ... ... ... .. ... | 8·56 | ,, |

The sum of the two last averages differs from the first, owing to the *last* including another year, which happened to be a very wet one.

Yours truly,

S. KING.

*Elswick Lodge, Garstang, April 2nd*, 1880.

*To the Editor of the Meteorological Magazine.*

SIR,—The winter and spring rainfall having been exceptionally light, the following record may prove of interest.

The amount given for March includes a heavy fall of snow on the 2nd, amounting to 1·48 in. in the 24 hours. Deducting this, the small total for seven months will be very apparent.

The drought is exceptional for this locality, including, as it does, the usually *very wet* month of October.

| | | |
|---|---|---|
| 1879. | October ..... | 1·13 in. |
| ,, | November ..... | 1·12 ,, |
| ,, | December ..... | 1·75 ,, |
| 1880. | January ..... | ·65 ,, |
| ,, | February ..... | 1·34 ,, |
| ,, | March..... | 2·27 ,, |
| ,, | April ..... | 1·27 ,, |
| | Total for 7 months ..... | 9·53 inches. |

Diameter of gauge, 5 in.; height above ground, 1 ft. 11 in.; height above sea level, 118½ ft.: situation fairly exposed.—Yours faithfully, ARTHUR R. ANDERSSON.

*Breeze Hill, near Liverpool, 3rd May,* 1880.

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*To the Editor of the Meteorological Magazine.*

SIR,—I send a table showing the rainfall here during the last six months, and the six months immediately preceding that period. The contrast is rather striking.—Yours faithfully,

H. GEORGE FORDHAM.

*Odsey Grange, Royston, 18th April,* 1880.

*Monthly Rainfall for the Year ending March 31st,* 1880.

| Summer Half-Year. | | | Winter Half-Year. | | |
|---|---|---|---|---|---|
| 1879. | April ..... | 2·56 in. | 1879. | October ..... | ·60 in. |
| ,, | May ..... | 2·79 ,, | ,, | November ..... | ·78 ,, |
| ,, | June ..... | 4·42 ,, | ,, | December ..... | ·56 ,, |
| ,, | July ..... | 4·34 ,, | 1880. | January ..... | ·24 ,, |
| ,, | August ..... | 4·01 ,, | ,, | February ..... | 1·70 ,, |
| ,, | September ..... | 2·25 ,, | ,, | March..... | ·70 ,, |
| | Total..... | 20·37 ,, | | Total..... | 4·58 ,, |

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*To the Editor of the Meteorological Magazine.*

SIR,—I noticed in the *Meteorological Magazine* for April the note on the "dry period" by Rev. J. Byng. The rainfall at Lowestoft during the same time was as follows :—

| | | |
|---|---|---|
| 1879 | October ... ... ... | 1·405 inches. |
| ,, | November ... ... | 2·130 ,, |
| ,, | December ... ... | 0·636 ,, |
| 1880 | January ... ... ... | 0·065 ,, |
| ,, | February... ... ... | 1·659 ,, |
| ,, | March ... ... ... | 0·847 ,, |
| | Total ... | 6·742 inches. |

—Yours very truly, HORACE E. MILLER

*Belle-Vue Park, Lowestoft, 5th May,* 1888.

## THIRTY SUMMERS.

*To the Editor of the Meteorological Magazine.*

SIR,—If you care to publish the enclosed in compliance with Mr. Slade's wish, you can, or forward it to him.—Yours truly,

WM. LUCAS.

*Hitchen, 19th March,* 1880.

| YEAR. | May. | June. | July. | Aug. | Sept. | Oct. | Average of each year. |
|---|---|---|---|---|---|---|---|
| | ° | ° | ° | ° | ° | ° | ° |
| 1849... .. | 50·6 | 56·7 | 59·1 | 60·0 | 56·3 | 48·0 | 55·1 |
| 1850..... | 49·9 | 58·5 | 61·0 | 61·0 | 54·4 | 46·2 | 55·2 |
| 1851..... | 50·3 | 57·7 | 58·2 | 60·5 | 54·1 | 50·7 | 55·2 |
| 1852..... | 49·6 | 56·3 | 64·3 | 60·3 | 55·1 | 45·4 | 55·2 |
| 1853..... | 51·0 | 57·3 | 60·3 | 59·0 | 54·7 | 49·5 | 55·3 |
| 1854..... | 50·6 | 58·1 | 60·0 | 59·2 | 56·0 | 47·5 | 55·2 |
| 1855..... | 47·3 | 55·3 | 61·0 | 59·3 | 53·3 | 49·0 | 54·2 |
| 1856..... | 49·2 | 57·7 | 60·1 | 61·0 | 53·5 | 50·0 | 55·2 |
| 1857..... | 51·5 | 59·5 | 62·3 | 62·7 | 57·5 | 51·2 | 57·5 |
| 1858..... | 50·3 | 62·5 | 58·0 | 59·5 | 58·0 | 49·0 | 56·2 |
| 1859..... | 50·0 | 62·0 | 65·3 | 60·5 | 55·0 | 49·0 | 57·0 |
| 1860..... | 52·5 | 54·5 | 57·2 | 56·7 | 51·0 | 48·5 | 53·4 |
| 1861..... | 50·6 | 58·5 | 60·0 | 61·0 | 55·0 | 52·2 | 56·2 |
| 1862..... | 54·9 | 55·5 | 57·0 | 56·0 | 55·0 | 49·5 | 54·6 |
| 1863..... | 50·7 | 57·1 | 59·0 | 61·0 | 52·0 | 49·0 | 54·8 |
| 1864..... | 52·9 | 57·5 | 60·3 | 57·4 | 55·5 | 48·2 | 55·3 |
| 1865..... | 54·5 | 59·0 | 62·1 | 59·4 | 60·5 | 47·8 | 57·2 |
| 1866..... | 49·6 | 60·5 | 59·0 | 58·5 | 55·0 | 49·7 | 55·4 |
| 1867..... | 51·9 | 56·9 | 58·0 | 60·5 | 55·9 | 47·7 | 55·1 |
| 1868..... | 55·5 | 60·5 | 64·8 | 61·9 | 56·7 | 45·9 | 57·5 |
| 1869..... | 50·5 | 55·9 | 63·2 | 59·1 | 58·5 | 49·0 | 56·0 |
| 1870..... | 52·0 | 60·1 | 63·5 | 59·0 | 53·2 | 47·6 | 55·9 |
| 1871..... | 50·5 | 54·9 | 60·0 | 62·1 | 55·5 | 47·8 | 55·1 |
| 1872..... | 49·5 | 58·0 | 63·3 | 57·8 | 55·6 | 45·3 | 54·9 |
| 1873..... | 48·8 | 57·5 | 61·0 | 60·5 | 50·9 | 45·0 | 54·0 |
| 1874..... | 47·9 | 55·5 | 61·9 | 57·8 | 54·5 | 48·5 | 54·3 |
| 1875..... | 51·4 | 56·8 | 55·9 | 59·3 | 56·5 | 45·9 | 54·3 |
| 1876..... | 46·1 | 56·8 | 61·8 | 59·1 | 52·5 | 49·0 | 54·2 |
| 1877..... | 45·9 | 57·6 | 57·8 | 58·1 | 49·1 | 44·5 | 52·2 |
| 1878..... | 52·8 | 58·0 | 60·0 | 60·9 | 54·2 | 47·3 | 55·5 |
| 1879..... | 46·5 | 54·9 | 56·5 | 57·0 | 52·8 | 46·2 | 52·3 |
| AVERAGE.. | 50·6 | 57·7 | 60·5 | 59·6 | 54·8 | 48·1 | Average of 30 years 55·2 |

## SMALL WHIRLWIND.

*To the Editor of the Meteorological Magazine.*

SIR,—Referring to Mr. Devas's letter of the 1st inst. in this month's *Meteorological Magazine*, I am told that the whirlwind therein mentioned is common, and is known as "Rogers' Blast."

Yours faithfully,

FRED. COVENTRY.

*Ketton Hall, Stamford, April 21st,* 1880.

## REVIEWS.

*The Weather of* 1879, *as observed in the neighbourhood of London, and compared in all respects with that of an average year.* By EDWARD MAWLEY, F.M.S. 8vo. Bemrose and Sons, London, 1880.

A VERY useful record of a very exceptional year. Some persons may think that it is a strong statement for the author to make that "the observations taken at my own observatory, which is, perhaps, the best equipped of all the Meteorological Society's stations." We think the statement strictly true; but that being the case, we regret that Mr. Mawley has limited the note upon the "Position of the Instruments, &c.," to half a page; half-a-dozen pages would have been acceptable, including a plan of the grounds, for though few private observers would expend the time and money which Mr. Mawley does upon the perfecting of his observations, still the fully-detailed description of what he has done would be most useful as an almost perfect type, not everywhere to be copied, but to be generally striven after.

The pamphlet is instructive and interesting throughout, and several of the principal elements are given *in extenso* for every day in the year.

There is also a capital diagram giving the monthly values of barometer, thermometer, cloud, humidity, wind, and rain; total mortality, and that due to respiratory and zymotic diseases.

The summary for the year is so true a picture of London experience in 1879 that we cannot refrain from quoting part of the concluding remarks:—

"The year 1879 was colder than any of these 38 years, and, with one exception, the most gloomy. Both January and December, it will be noticed, were extremely cold, while July was extraordinarily dull. It is not, however, the remarkable dulness or coldness of certain months or seasons that calls for special notice here so much as the fact that the whole twelvemonth continued from first to last so persistently sunless and cold. Moreover, it should not be lost sight of that the two months preceding this year, as well as the month immediately following it, were all singularly cold ones.

"Nevertheless, if we leave out of consideration the important elements of temperature and sunshine, the same uniformity will not be found to have been in other respects maintained. In fact, 1879 appears to have shown in several ways a strange partiality for extremes. For instance, the fall of rain during the summer was excessive; but for the three months at the close of the year so slight as to be remarkable. Again, in July there was not a single calm day, whereas in December there was not for weeks together a single windy one. Then again in January the air was exceptionally dry, while in July it was more humid than in the corresponding month of any year since 1843—or for 36 years. The most seasonable and pleasant months were those of September and October, whereas the weather of July proved to be the most abnormal of all.

"If we now turn to the mortality curves on the diagram it will be at once seen that the death-rate in London was unusually high in the Winter and Spring, but remarkably low for the season during the height of Summer. Diseases of the respiratory organs proved very fatal during the earlier months of the year; while in July and August deaths traceable to those of the zymotic class fell much below the average number.

"As regards the influence of the season upon vegetation. Never before had the present generation of agriculturalists experienced so disastrous a year. In most cases the hay-crop was harvested in very bad condition. The wheat approached nearer to a total failure than in any year of our period; other descriptions of corn being also as a rule very late and deficient in yield; while the roots, although usually supposed to delight in moisture, came to no size. To the horticulturist the year was hardly more favourable, the prolonged and severe winter killing all but hardy plants in the flower-garden, and a large proportion of the winter stock of vegetables in the kitchen-garden. The fruit season was, moreover, late, and the crops very poor. In fact, almost the only crop that appeared to rejoice in the frequent and heavy rains, the sunless skies and the low temperatures of last Summer, was the crop of weeds, which true to the proverb concerning them, 'grew apace,' and such was the condition of the ground that it was quite impossible to keep them under."

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*Climate and Health in South Africa.* By J. BONWICK, F.R.G.S. 12mo. S. W. Silver & Co.

To write a perfect manual of climate there are so many qualifications necessary that we doubt if it is possible for one person to possess them all. The author should have had personal experience of the locality to be described, and of others wherewith to compare it; he should be as impartial as a judge; well up in Meteorology, and possess some acquaintance with Botany and Geology. Then he should be sufficiently familiar with medical matters to command the attention of the medical profession; and lastly, he should, without being a mere bookmaker, be at any rate an easy and fluent writer.

The author of the work before us has given a capital collection of extracts, facts and opinions, and we know of no work of equal size giving half the information. The author is evidently not a meteorologist, or he would have prevented the printers constantly printing degrees and tenths of degrees of temperature, as degrees and minutes of arc!

The following account of a dust storm at Griqua Land West may be regarded as a specimen of the lighter portion of this chatty but instructive work —

"On Sunday evening week the Du Toit's Pan, De Beer's, and New Rush camps were maddened by a dust-storm from the north-west, which lasted nearly a couple of hours. We have been asked to write an artistic description of the event; but, as we had to shut ourselves up within our small cabin to prevent ourselves being blown away, and to ballast the cabin itself; and as during the said two hours our eyes, in common with the eyes of all the camps, were blinded with dust, and our ears deafened with the flapping of canvas, and the rush of the wind, and the roar of thunder, description is impossible. All we can say from personal observation and experience is, that the dust was the finest, most searching, the densest, the most pervading, and the most irritating we ever had the good fortune to see, smell, taste, or feel. The dust of the dry diggings is to be classed with plague, pestilence, and famine, and if there is anything worse, with that also. The wind was very wilful, and did a great deal of damage. Half the population in the Fields had to hold on by the poles and ropes like grim death during the time the storm lasted. In some cases holding on was no use."

# SUPPLEMENTARY TABLE OF RAINFALL IN APRIL, 1880.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 1·98 | XI. | Corwen, Rhug ..... | ... |
| ,, | Margate, Acol ..... | 1·17 | ,, | Port Madoc ..... | 2·32 |
| ,, | Littlehampton ..... | 1·82 | ,, | Douglas..... | 3·05 |
| ,, | St. Leonards ..... | 2·23 | XII. | Carsphairn ... ..... | 5·83 |
| ,, | Hailsham ..... | 1·69 | ,, | Melrose, Abbey Gate... | 2·59 |
| ,, | I. of W., St. Lawrence. | 1·76 | XIV. | Glasgow, Queen's Park. | 3·11 |
| ,, | Alton, Ashdell..... | 2·15 | XV. | Islay, Gruinart School.. | 2·93 |
| III. | Great Missenden..... | 2·80 | XVI. | Cupar, Kemback..... | 3·10 |
| ,, | Winslow, Addington ... | 2·03 | ,, | Aberfeldy H.R.S. ..... | 2·61 |
| ,, | Oxford, Magdalen Col... | 1·89 | XVII. | Tomintoul..... | 3·86 |
| ,, | Northampton ..... | 1·23 | ,, | Keith H.R.S. ..... ..... | 2·36 |
| ,, | Cambridge, Merton Vil. | 1·77 | ,, | Forres H.R.S. ..... | 1·15 |
| IV. | Harlow, Sheering ..... | 2·13 | XVIII. | Strome Ferry H.R.S.... | 5·16 |
| ,, | Diss ..... | 1·55 | ,, | Auchnasheen H.R.S. ... | ... |
| ,, | Swaffham ..... | 2·49 | ,, | Lochbroom ..... | 2·36 |
| ,, | Hindringham ..... | 2·29 | ,, | Tain, Springfield..... | 1·46 |
| V. | Salisbury, Alderbury... | 1·90 | ,, | Loch Shiel, Glenfinnan. | 7·77 |
| ,, | Calne, Compton Bassett | 2·01 | ,, | Dalwhinnie H.R.S..... | 3·84 |
| ,, | Beaminster Vicarage ... | 2·47 | XIX. | Lairg H.R.S. ..... | 1·94 |
| ,, | Dartmoor, Princetown.. | ... | ,, | Altnabreac H.R.S. ..... | 1·50 |
| ,, | Langtree Wick ..... | 2·00 | ,, | Watten H.R.S. ..... | 1·89 |
| ,, | Lynmouth, Glenthorne. | 2·41 | XX. | Fermoy, Glenville ..... | 3·61 |
| ,, | St. Austell, Cosgarne... | 3·11 | ,, | Tralee, Castlemorris ... | 4·25 |
| ,, | Taunton ..... | 1·88 | ,, | Cahir, Tubrid ..... | 4·40 |
| VI. | Bristol, Ashleydown ... | 1·91 | ,, | Tipperary, Henry St.... | 4·11 |
| ,, | Ross ..... | 1·52 | ,, | Newcastle West ..... | 3·80 |
| ,, | Wem, Sansaw Hall..... | 1·62 | ,, | Kilrush ..... | 3·40 |
| ,, | Cheadle, The Heath Ho. | 1·43 | ,, | Corofin ..... | ... |
| ,, | Bickenhill Vicarage ... | 1·08 | XXI. | Kilkenny, Butler House | 2·58 |
| VII. | Melton Mowbray ..... | 1·75 | ,, | Carlow, Browne's Hill.. | 2·91 |
| ,, | Horncastle, Bucknall ... | 2·36 | ,, | Kilsallaghan..... | 2·56 |
| VIII. | Walton-on-the-Hill..... | 1·27 | ,, | Navan, Balrath ..... | 2·68 |
| ,, | Broughton-in-Furness .. | 2·74 | ,, | Athlone, Twyford ..... | 4·26 |
| IX. | Wakefield, Stanley Vic. | 1·79 | ,, | Mullingar, Belvedere ... | 3·30 |
| ,, | Ripon, Mickley ..... | 1·99 | XXII. | Ballinasloe ..... | 3·69 |
| ,, | Scarborough..... | 2·36 | ,, | Clifden, Kylemore ..... | 7·49 |
| X. | Mickleton..... | 3·25 | ,, | Crossmolina, Enniscoe.. | 4·99 |
| ,, | Haltwhistle, Unthank.. | 2·82 | ,, | Carrick-on-Shannon ... | 3·53 |
| ,, | Shap, Copy Hill ..... | 4·02 | XXIII. | Dowra ..... | 4·05 |
| XI. | Llanfrechfa Grange ..... | 2·13 | ,, | Rockcorry..... | 4·22 |
| ,, | Llandovery ..... | 2·99 | ,, | Warrenpoint ..... | 3·75 |
| ,, | Solva ..... | 2·57 | ,, | Newtownards ..... | 3·56 |
| ,, | Castle Malgwyn ..... | 3·01 | ,, | Carnlough..... | 5·58 |
| ,, | Rhayader, Nantgwillt.. | 3·10 | ,, | Bushmills ..... ..... | 2·62 |
| ,, | Carno, Tybritle ..... | 2·82 | ,, | Buncrana ..... | 2·95 |

# APRIL, 1880.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1860–5 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date. | Min. Deg. | Date. | No. of Nights below 32° In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | Camden Square | 2·15 | + 1·02 | ·73 | 14 | 17 | 67·4 | 19 | 34·3 | 27 | ... | 7 |
| II. | | Maidstone (Hunton Court) | 1·67 | + ·52 | ·32 | 14 | 14 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss | 1·63 | ... | ·42 | 14 | 13 | 65·5 | 19 | 32·1 | 26 | ... | 14 |
| III. | | Hitchen | 1·50 | + ·50 | ·41 | 14 | 18 | 61·0 | 20 | 32·0 | 7 | 1 | ... |
| ,, | | Banbury | 2·04 | + ·88 | ·31 | 14 | 17 | 62·3 | 20 | 31·0 | 27 | 3 | ... |
| IV. | | Bury St. Edmunds (Culford) | 2·37 | + 1·62 | ·75 | 25 | 16 | 68·0 | 19 | 28·0 | 30 | 6 | 10 |
| ,, | | Norwich (Cossey) | 1·88 | + 1·09 | ·32 | 6 | 20 | 67·0 | 19 | 32·0 | 30 | 1 | 4 |
| V. | | Bridport | 1·97 | + ·49 | ·52 | 14 | 14 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple | 2·62 | + ·61 | ·59 | 5 | 15 | ... | ... | ... | ... | ... | ... |
| ,, | | Bodmin | 2·54 | + ·84 | ·47 | 1 | 14 | 60·0 | 3 | 34·0 | 30 | 0 | 10 |
| VI. | | Cirencester | 2·21 | + ·92 | ·41 | 14 | 14 | ... | ... | ... | ... | ... | ... |
| ,, | | Shifnal (Haughton Hall) | 1·57 | + ·42 | ·42 | 15 | 17 | 60·0 | 19 | 29·0 | 30 | 5 | 5 |
| ,, | | Tenbury (Orleton) | 2·12 | + ·58 | ·72 | 15 | 20 | 66·2 | 25 | 27·3 | 30 | 2 | 11 |
| VII. | | Leicester (Town Museum) | 1·57 | ... | ·34 | 3 | 21 | 64·2 | 19 | 32·5 | 30 | 0 | 20 |
| ,, | | Boston | 2·49 | + 1·52 | ·37 | 14 | 16 | 68·0 | 19 | 34·0 | 30 | 0 | ... |
| ,, | | Grimsby (Killingholme) | 1·79 | ... | ·30 | 6 | 15 | 64·0 | 17 | 32·0 | 30 | 0 | ... |
| ,, | | Mansfield | 1·28 | ... | ·39 | 15 | 18 | 64·4 | 19 | 26·2 | 30 | 1 | 4 |
| VIII. | | Manchester (Ardwick) | 1·56 | + ·14 | ·51 | 4 | 17 | 60·0 | 3,19 | 35·0 | 30 | 0 | ... |
| IX. | | York | 2·08 | + ·98 | ·67 | 3 | 16 | 65·0 | 17* | 30·0 | 30 | 1 | ... |
| ,, | | Skipton (Arncliffe) | 3·12 | + ·08 | ·47 | 3 | 25 | ... | ... | ... | ... | ... | ... |
| X. | | North Shields | 1·74 | + ·43 | ·29 | 6 | 17 | 59·0 | 19† | 32·0 | 30 | 1 | 1 |
| ,, | | Borrowdale (Seathwaite) | 9·89 | + 2·99 | 2·26 | 21 | 22 | ... | ... | ... | ... | .. | ... |
| XI. | WALES. | Cardiff | 1·98 | ... | ·40 | 3 | 13 | 61·0 | 25 | 35·6 | 26 | 0 | ... |
| ,, | | Haverfordwest | 2·88 | + 1·02 | ·65 | 15 | 17 | 58·0 | 19 | 30·0 | 30 | 4 | 13 |
| ,, | | Aberdovey | ... | ... | ... | .. | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno | 1·24 | — ·26 | ·39 | 3 | 12 | 59·8 | 19 | 34·0 | 14 | 0 | ... |
| XII. | | Cargen | 3·46 | + 1·62 | 1·08 | 18 | 15 | 59·4 | 30 | 30·0 | 30 | 4 | ... |
| ,, | | Hawick (Silverbut Hall) | 2·77 | ... | ·65 | 13 | 20 | ... | ... | ... | ... | ... | ... |
| XIV. | | Douglas Castle (Newmains) | 4·59 | ... | 2·10 | 21 | 17 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Long (Arddaroch) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Kilmory | 3·43 | ... | ·51 | 1 | 19 | ... | ... | 28·0 | 27 | 6 | ... |
| ,, | | Mull (Quinish) | 4·50 | ... | ·81 | 3 | 17 | ... | ... | ... | ... | ... | ... |
| ,, | | Loch Leven | 3·60 | + 2·08 | 1·30 | 22 | 12 | ... | ... | ... | ... | ... | ... |
| XVII. | SCOTLAND. | Arbroath | 2·67 | + 1·48 | ·74 | 21 | 14 | 59·0 | 20 | 34·0 | 30 | 0 | ... |
| ,, | | Braemar | 3·02 | + 1·62 | ·76 | 18 | 20 | 57·8 | 30 | 25·3 | 12 | 4 | 23 |
| XVIII | | Aberdeen | 3·10 | ... | 1·03 | 21 | 20 | 58·0 | 20 | 32·0 | 29 | 1 | ... |
| ,, | | Portree | 5·16 | — ·11 | ·78 | 18 | 19 | ... | ... | ... | ... | ... | ... |
| ,, | | Inverness (Culloden) | 1·05 | — ·42 | ·23 | 22 | ... | 62·2 | 17 | 30·8 | 9,12 | 2 | 16 |
| XIX. | | Dunrobin | 1·90 | + ·66 | ·30 | 24 | 17 | 57·5 | 21 | 32·0 | 4,30 | 2 | ... |
| ,, | | Sandwick | 1·72 | — ·02 | ·45 | 24 | 18 | 57·8 | 20 | 35·4 | 26 | 0 | 2 |
| XX. | | Cork | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Darrynane Abbey | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Waterford | 3·36 | + 1·13 | ·59 | 15 | 15 | 61·0 | 2 | 35·0 | 14‡ | 0 | ... |
| ,, | | Killaloe | 4·41 | + 2·28 | ·69 | 21 | 19 | 68·0 | 30 | 32·0 | 12 | 1 | ... |
| XXI. | IRELAND. | Portarlington | 2·98 | + ·96 | ·54 | 15 | 22 | 58·0 | 19 | 32·0 | 27 | 2 | ... |
| ,, | | Monkstown | 1·78 | + ·14 | ·69 | 15 | 16 | ... | ... | ... | ... | ... | ... |
| XXII. | | Galway | 3·60 | ... | ·81 | 20 | 19 | 60·0 | 29 | 34·0 | 27 | 0 | ... |
| XXIII | | Waringstown | 4·02 | ... | 1·23 | 21 | 19 | 62·0 | 19 | 31·0 | 8§ | 5 | 7 |
| ,, | | Londonderry | 3·74 | ... | ·50 | 5 | 22 | 63·8 | 30 | 35·0 | 9,27 | 0 | 9 |
| ,, | | Edenfel (Omagh) | 3·41 | ... | ·56 | 21 | 24 | 65·0 | 28 | 28·0 | 29 | 9 | ... |

* And 19. † And 20. ‡ And 27, 30. § And 11, 26, 29.

\+ Shows that the fall was above the average; — that it was below it.

# METEOROLOGICAL NOTES ON APRIL.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—A fine yet showery April, following a dry March, revived our agricultural expectations. So far all has gone well; wheat crop very promising; wild cherry in flower on 1st, dog violet on 3rd, pear on 5th; first goslings seen on 5th; blackthorn in flower on 8th; elm in leaf on 9th; cuckoo first heard on 15th, nightingale on 18th, wryneck on 19th, first swallow seen on 20th; oak in leaf on 21st, wild strawberry in flower on 22nd.

BANBURY.—TS with soft H on afternoon of 8th; H on 2nd and 26th; high wind on 27th, 28th, and 29th. Blackthorn in flower on 17th.

CULFORD.—A month of very favourable weather, without great depressions of temp. likely to prove injurious to crops of any kind. Mean temp., 47°·4. Nightingale first heard on 18th, and swallows first seen on 19th. About the 25th the weather became colder, and the song of the nightingale was discontinued for several days; the cuckoo was not heard till the 30th. T on 7th and 22nd; H on 5th, 6th, and 26th; windy on 21st.

COSSEY.—Sand martins arrived on 18th, and swallows on 23rd.

BODMIN.—Mean temp. of month 49°·4. The nights were intensely cold from the 22nd to the end of the month, and on the morning of the 30th the grass min. fell to 24°.

CIRENCESTER.—The early part of the month was mild with S.W. and W. winds; towards the end it was rather cold with N.E. and E. winds. Rainfall moderate.

SHIFNAL.—As genuine an April as it had been a true March. Showers and sunshine, with westerly winds and growing weather till the 8th, when it suddenly turned cold with N. and N.E. winds, and remained so till the 16th, then pleasant again, with S. and S.W. winds and low bar., till 24th. The remainder of the month was cold and ungenial, with rising bar., and terminated with a sharp frost and ice as thick as a penny on 30th. TS on 6th. Young rooks seen on 9th, sand martins arrived on 12th, wild cherry in bloom and first swallow seen on 19th, willow-wren seen on 24th, cuckoo heard on 26th, damson trees in full bloom on 27th.

ORLETON.—The weather was generally cloudy, with strong winds, chiefly from N. and E., and frequent light falls of R, but not amounting to the average quantity; there were a few bright days. The temp. was about 1½° below the average, but the fluctuations were small, and there were few frosty nights. Early plum trees were in blossom about the 20th, and cherry trees about the 23rd, Swallows were seen on the 21st, and the chiff-chaff on the 24th. The cuckoo was heard on the 23rd; T was heard on the 6th, 7th, 13th and 22nd. A very favourable month for farm work.

LEICESTER.—T heard on afternoons of 5th and 6th; lunar halo on 19th.

BOSTON.—The temp. of the month is slightly below the average, but the changes were very great, some days being bright with warm sunshine and a mean temp. of 56°, and others, cold and dull with cutting N.E. winds. Two TSS at the beginning of the month. Cuckoo first heard on 25th. The total rainfall from the beginning of autumn to the end of this month is more than 23 in. below the average of 20 years.

KILLINGHOLME.—Swallows seen on 24th; cuckoo heard on 30th.

MANCHESTER.—A fine spring month, with moderate temp. and genial showers in the early part of it. Vegetation has progressed slowly, being retarded by the cool nights; but general appearances are promising.

YORK.—TSS on 5th and 7th; H on 6th, 25th, and 26th.

NORTH SHIELDS.—TS with H and R on 22nd, and T on 5 days. Aurora on 8th and 14th.

SEATHWAITE.—No spring weather during the month; cold N.W. winds at the beginning; and cold E. winds in the middle; frosts at night at the end.

## WALES.

HAVERFORDWEST.—Showery weather during the first week, then much colder, with night frosts till the 13th, when a very wet period set in; the R was cold and the weather ungenial; at times it blew very hard. From the 20th to the 22nd was very stormy, the wind rising to a full gale; from the 23rd to the 30th the weather was most ungenial, bright sunshine, bitter winds, air very dry, and sharp frosts at night; nearly as bad as April, 1879. T and L on 15th; T heard on several days. Wind blew from E., N.E. and S.E. on fifteen days, W. and N.W. on twelve days, and only three days from S.W. and S.

LLANDUDNO.—A fine spring month, rainfall and mean temp. both below the average, the former to the extent of about half-an-inch, and the latter by about a degree and a half. No frost and a great amount of sunshine. S on distant hills on 26th.

## SCOTLAND.

HAWICK.—East winds prevailed throughout the month; gales on the 20th and 21st; T heard on 22nd; hills white with S on the 25th.

QUINISH.—A showery, unsettled month; rather cold from 1st to 19th. Vegetation and foliage very far advanced. Strong gale from S. on 18th.

BRAEMAR.—A month of cold easterly winds.

ABERDEEN.—During the first part of the month northerly to north-westerly winds prevailed, and from the 11th till the close easterly, varying from N.N.E. to S.S.E., with passing showers of cold rain. Rainfall about the average.

PORTREE.—A cold month; from 4th to 6th squally, and from 15th to 24th squally, with H and sleet showers; fresh S on hills from 15th to end of month. Pasture grass much behind the usual condition at this time of year.

CULLODEN.—Month generally fine; out-door labour advanced, cereals got down in good condition; pastures well forward by the close of the month. Forest trees early in leaf.

SANDWICK.—The weather was very favourable for agricultural operations. S.E. winds prevailed in the early part of the month and N.W. in the latter part. Rainfall rather less than the mean of the previous 39 years. Primroses were in flower on 12th and gooseberries and currants on 17th. Aurora on 29th.

## IRELAND.

WATERFORD.—Wind very high in night of 17th and all day on 18th. T S on 4th; H on 4th, 5th, and 6th. Lunar corona on 20th.

KILLALOE.—Almost continuous rain for the first three weeks, with very severe S.E. gales from 18th to 20th; latter days of month very fine, with low temp., until 30th, when the max. in shade registered 68°.

WARINGSTOWN.—Very fine and seasonable, in spite of considerable rainfall; farming operations forward.

LONDONDERRY.—On the whole the wettest month we have had for some time; wind principally N.E. and S.W.

# SYMONS'S

## MONTHLY

# METEOROLOGICAL MAGAZINE.

CLXXIII.] JUNE, 1880. [PRICE FOURPENCE. *or 5s. per ann. post free.*


## METEOROLOGY IN FRANCE.

Resuming our notice of the first volume of the *Annales du Bureau Central Météorologique*, we have first two papers by M. Edmond Becquerel on underground temperature observations made at the Natural History Museum during 1877 and 1878 by means of electric thermometers. The observations may be divided into two series —(1) those relating to variation in temperature due to depth below the surface; (2) those indicating the influence upon underground temperature produced by the turfed or bare state of the soil.

The first series give the following results :—

| Depth. French. Metres. | Depth. English. ft. | in. | | Mean temperature 1861-78. Centigrade. ° | Fahr. ° | Diff. for equal increments of depth. |
|---|---|---|---|---|---|---|
| 1 | 3 | 3 | ..... | 11·25 | 52·25 | |
| 6 | 19 | 8 | ..... | 11·97 | 53·55 | +1·30 |
| 11 | 36 | 1 | ..... | 12·02 | 53·64 | + ·09 |
| 16 | 52 | 6 | ..... | 12·07 | 53·73 | + ·09 |
| 21 | 68 | 11 | ..... | 12·11 | 53·80 | + ·07 |
| 26 | 85 | 4 | ..... | 12·38 | 54·28 | + ·48 |
| 31 | 101 | 8 | ..... | 12·34 | 54·21 | − ·07 |
| 36 | 118 | 1 | ..... | 12·44 | 54·39 | + ·18 |

It is very clear from the last column that there is some serious cause for doubting these results. M. Becquerel ignores the most startling irregularity, viz., that between one metre and six metres, but he says that the irregularities at 16 and 26 metres are due to the subterranean water stratum. The observations at 6, 11, 16, 31, and 36 metres are very fairly in accordance, but they accord in giving an increase of only 1° in 156 ft. against 1° in 54 ft. at Kentish Town, or (better comparison still, for it is close by) 1° in 59 ft. in the Puit de Grenelle at Paris.

The final results of mean annual temperature under bare and turfed soil are, in Fahrenheit degrees, as follows :—

| Depth. | 2 in. | 4 in. | 8 in. | 1 ft. | 2 ft. |
|---|---|---|---|---|---|
| Turfed ..... | 53·20 | 53·17 | 52·86 | 53·06 | 52·79 |
| Bare ..... | 52·50 | 51·91 | 51·40 | 51·51 | 51·82 |
| Difference ..... | −0·70 | −1·26 | −1·46 | −1·55 | −0·97 |

The next article is by M. Angot, and is introductory to, and ex-

planatory of, a set of tables for reducing barometric readings to their equivalent sea level pressures. We consider that they are the most generally useful yet issued for instruments with metric scales, accurate and compact. M. Angot also shows observers how to combine the tables, for the correction of the readings at their own station by a single operation.

M. Hildebrand Hildebrandsson in a paper on the freezing of the lakes, and on phenological phenomena, in Sweden, attacks the question as to the existence or otherwise of any material change in the seasons during the last or present century, and finds no distinct evidence of any change.

The last memoir in the volume is a history, by M. Rollin, of the hurricane which passed from the Bay of Biscay across the centre of France during February 20th, 1879. The article is very interesting, very well written, illustrated by synoptic charts for each third hour from 9 a.m. to 9 p.m., both inclusive, and will in all respects well repay perusal. We can spare space for only a few remarks.

The only deficiency which we notice in the paper is that of tables. M. Rollin has succeeded in writing a very agreeable memoir, but every now and then we miss some data of which we should have been glad, *e.g.*, on page C 50, there is a paragraph embodying the observations on the light-ship off Rochebonne, but a little table giving the readings *in extenso* would have been most useful.

The dissimilarity between the ordinary 8 a.m. international chart for Feb. 20th, which is here reprinted, and the special one for 9 a.m., only one hour later, is to us an unpleasant feature; for one cannot but see that the 8 a.m. isobars would have been less incorrect had they not been carried out beyond terra firma. That a hurricane with a baric minimum of about 730$^{mm.}$ (28·74 in.) should be within fifty or sixty miles of a coast well provided with observing stations, and yet should not have given sufficient indication of its presence to prevent the authorities from running an isobar of 745$^{mm.}$ (29·33 in.) through its centre, shows either sluggishness in the barometers employed, or an insufficient number of stations; but beyond all it shows, as we have already said, how risky it is to draw isobars over seas whence no observations have been received.

At the same time that we protest against isobars based chiefly upon the imagination, we are very glad to express our opinion that even now, it is not easy to suggest what better warnings could have been issued than those that were actually despatched.

We may quote an instance or two illustrative of the force of both wind and tide. At Bordeaux, a vessel was driven irresistibly on to a sand bank and completely beached, the furious sea continued to push it, and finally drove it through the bank into deep and smooth water beyond. At Barbezieux in Charente, M. Gillet saw the body of a little cart taken off its axle by the wind, and by calculation based on its weight, its area, the angle at which the cart was placed, &c., he found that the velocity of the wind was 80 miles an hour,

which, says M. Rollin, is almost identical with the rate of translation (85 miles) of the hurricane itself as far as Nevers.

Here is a note bearing upon the late Tay Bridge inquiry :—

The verbatim report of the sitting of the Meteorological Commission of l'Allier, furnishes us with a fact illustrating the extreme force of the tempest. Monsieur Voisin has calculated that a minimum force of 138 kilogrammes per square metre (34¼ lbs. per square foot) would have been necessary for the wind, in order to throw over in Sioule, four carriages of a train passing over the viaduct of Saint Bonnet, of which the height above low water mark is 66 metres (217 feet). He adds, that the bridge has been calculated to resist a wind exercising a lateral pressure of 170 kilogrammes per square metre (42 lbs. per square foot).

With respect to barometric variations, we have the actual values for Clermont, and diagrams for the Puy-de-Dôme and for Rochefort. As we have already said, we regret the absence of some tabular matter, but the barometer curves are so remarkable that we have done our best to determine the values in English measures. Of course, the minimum occurred much earlier at Rochefort on the coast than in Auvergne ; it was almost exactly three hours earlier, but, in order that the table may not be confused by this fact, all the Rochefort figures are entered lower than the others, this brings all the minima into one line, and the time being separately given prevents all confusion.

| ROCHEFORT. | | | PUY-DE-DÔME. | | | CLERMONT. | |
|---|---|---|---|---|---|---|---|
| Time. | Reading. | Fall or Rise per hour. | Time. | Reading. | Fall or Rise per hour. | Reading. | Fall or Rise per hour. |
| | in. | in. | | in. | in. | in. | in. |
| | | | 6 a.m... | 24·63 | | 28·17 | |
| | | | 9 a.m... | 24·56 | —·02 | 28·06 | —·04 |
| 9 a.m... | 29·28 | —·14 | Noon ... | 24·33 | —·08 | 27·89 | —·06 |
| Noon ... | 28·86 | —·02 | 3 p.m... | 23·93 | —·13 | 27·66 | —·08 |
| 0½ p.m... | 28·85 | +·27 | 3¼ p.m... | 23·91 | —·08 | 27·60 | —·24 |
| 2 p.m... | 29·26 | +·15 | 3½ p.m... | ... | ... | ... | ... |
| 3 p.m... | 29·41 | | 4¾ p.m... | 23·89 | —·01 | 27·60 | —·00 |
| | | | 5 p.m... | ... | ... | ... | ... |
| | | | 6 p.m... | 24·07 | +·14 | 27·74 | +·11 |

We are inclined to regard the rate of rise reported from Rochefort 0·41 in. in an hour and a half, or 0·27 in. per hour, as extremely rapid, but we know of no table giving a list of extremely rapid barometric changes. Perhaps somebody will either state where one is to be found, or will compile one.

In conclusion, we must congratulate M. Mascart on his first volume. It is our duty to point out features which appear to us capable of improvement, but it is also a duty, and a far more agreeable one, to praise that which seems worthy of it. Probably it may be long ere we can spare space to notice subsequent volumes at equal length, but we think that our readers will join us in anticipating much pleasant and instructive reading in the *Annales du Bureau Central Météorologique de France.*

## GREENWICH OBSERVATORY.

UNDER the combined influences of a slight relaxation in the exclusiveness of the invitations, and of fine weather, "Visitation-day" drew a large gathering to the establishment of which Englishmen are so justly proud, and which Sir George Airy directs with as much vigour as he did when he was appointed Astronomer Royal very nearly half a century since.

The following are the paragraphs of the annual report which bear most closely upon meteorology :—

"The exceptionally bad weather of the past summer has seriously interfered with the observations, a whole month's observations of the sun being lost in July.

"The Thomson Electrometer is in excellent order. In the warm weather of summer, and in winter when much artificial heat is used in the basement, the photographs have been unsatisfactory, but we are endeavouring to remedy this by cutting off all communication with air from the basement. In the winter the register was frequently interrupted by the freezing of the water in the exit-pipe. A basin (with cesspool) has been recently constructed to carry off the water discharged from this pipe.

"The action of the photographic barometer appears to have been improved by the slight changes mentioned in the last report, and small movements are in many cases excellently shown.

"A new pressure-plate with springs has been applied by Mr. Browning to Osler's Anemometer, and it is proposed to make such modification as will give a scale extending to 50 lbs. pressure on the square foot. Other parts of the instrument have also been renewed. An arrangement for slow motion of the barrel, which was much wanted in adjusting the recording paper, has been fitted to Robinson's Anemometer.

"It is in contemplation to alter the photographic cylinders of the magnetometers, barometer, thermometers, and earth-current apparatus, so as to make the time-scales of all the magnetical and meteorological instruments the same.

"The radiation thermometers were shifted at the end of January to a more open position in the south ground.

"All thermometers in ordinary use have been compared with the standard.

"Since last October the Police-ship "Royalist" has been laid up in dock, having been injured by a collision, and the observations of temperature of the Thames have been interrupted in consequence.

"The mean temperature of the year 1879 was 46°·1, being 3°·3 below the average of the preceding 38 years. The highest temperature was 80°·6 on July 30, and the lowest 13°·7 on December 7. The mean temperature was below the average in every month of the year ; the months of greatest deviation being January and December, respectively 6°·8 and 7°·6 below the average ; the months of April, May, July, and November were each between 4° and 5° below the average.

"The mean daily motion of the air in 1879 was 268 miles, being 11 miles less than the average. In July the mean daily motion was 78 miles above the average, and in December 75 miles below. The greatest daily motion was 705 miles on December 30, and the least 32 miles on October 12.

"The vane of Osler's anemometer made, in the year 1879, thirty-one complete revolutions in the positive direction N, E, S, W, N.

"The number of hours of bright sunshine, recorded with Campbell's sunshine instrument, during 1879, was only 983. At Glynde (near Lewes) the

number of hours registered with a similar instrument, erected by the Right Hon. H. Brand, Speaker of the House of Commons, was 1040, being larger than at Greenwich in April, May, and October, and smaller in July. At Mr. Campbell's request and private expense a diagram has been prepared, under the Observatory superintendence, exhibiting the record of sunshine on each day throughout the year 1879.

"From various causes the magnetical and meteorological reductions had gradually fallen behind, and an endeavour is now being made to bring them into a more forward state."

## THE WEATHER IN MAY.

The anticyclone which lay over these islands during the last four days of April was shown in much the same position on the 1st May. Pressure, however, had begun to decrease, and a depression was in course of formation in the S. On the 2nd the bar. fell over the whole of Western Europe, and the distribution became irregular; areas of high pressure lying over Ireland and Denmark, and of low pressure over Scotland and France. A recovery began on the next day in N. Scotland and over Scandinavia, as well as in S. France; the rise in the N. extending slowly southward later in the day. Readings were highest over the Baltic, lowest over France.

Very dry and moderately clear weather was almost general during the week (4th–10th). On the 4th the bar. rose in all parts of Western Europe, but fell in the extreme N. of Norway and Sweden. An area of high pressure was over the northern and western coasts of our islands, and low readings were reported from France, N. Germany, and N.W. Norway. A slow decrease began on the following day in the N., but still increased nearly everywhere else. The distribution of pressure during the next two days was subject to little change. On the 8th the bar. fell on the W. and S.W. coasts of these islands and over Sweden, while it rose elsewhere. An area of high readings lay over Great Britain, a small depression off our S.W. coasts, and larger disturbances over the Baltic and S.E. France.

Temperature was below the mean everywhere; as much as 5° or 6° at most places in England, and from 2° to 4° elsewhere. The maximum was generally very low for the time of year, and over the central and northern parts of Great Britain and central Ireland several slight frosts occurred, the lowest minimum being 28° at Durham. Rainfall again less than the average in all districts.

Bright sunshine, except in the western parts of Great Britain, showed a decided decrease. In S. and E. England and E. Scotland the number of hours recorded was only about one-fourth of the total possible duration. In London the per centage was particularly small.

The weather during the following week (11th–17th) continued clear and very dry over Great Britain and the Continent. In Ireland the sky was cloudy or overcast at the beginning of the week.

The changes in atmospheric pressure were very irregular, but slight. Readings were high throughout the week (especially over these islands), except over the N. coast of Spain and at Biarritz.

Temperature was several degrees higher than during the week preceding. It was about the mean in S. England and S. Ireland, but below the average elsewhere. On the 14th and 15th the ther. was especially high, and in the S. of England very high readings were recorded: 78° at Southampton, 75° at Hastings and in London, 74° at Strathfield Turgiss. At Yarmouth the maximum was only 55°, and at Durham 59°, the deficit from the average being as much as 4°·3 at the former place, and 5°·5 at the latter.

Rainfall nil at many places, and scarcely measurable at many more other places. The largest falls were 0·36 in. at Valentia, 0·29 in. at Roche's Point, 0·41 in. at Leicester, and 0·23 in. at Strathfield Turgiss.

During the following week (18th–24th) several important changes in the distribution of atmospheric pressure occurred. On the 18th the bar. began to

fall slowly in the N. of Great Britain, while it rose elsewhere—especially in the S.W. This fall continued during the day, and the centre of a small depression lay off the coast of Norway, while the area of high pressure was off the W. coast of Ireland.

In the course of the following 24 hours a rather large depression advanced from the Atlantic to the coast of Norway; the bar. consequently fell rather briskly over the countries to the E. of the North Sea, while over the whole of these Islands and France it rose, the change being greatest in the N. of Scotland. Pressure remained steady in the W. Later in the day (20th) a decrease of pressure began in Scotland, which the charts of the 21st showed to be caused by the advance of a secondary depression, travelling eastward; pressure thus becoming highest in the S.W. During the 21st and the night (21st-22nd) a considerable fall of the bar. took place over the whole of Western Europe; the centre of a well-formed depression having passed across the northern part of these Islands, which disappeared in the course of the day. The bar. then rose, but in the early morning of the 23rd a large depression appeared in the N.W. of these Islands, causing pressure to decrease rapidly; the weather gradually becoming unsettled.

Temperature from 18th to 22nd changed irregularly, but a general fall was reported on the morning of the 22nd, the decrease being as much as 5° or 6° in Scandinavia, 6° to 8° in Belgium, and 7° at Liverpool. The difference in the maxima of the two days, 22nd and 23rd, was 13° in London and Cambridge, 11° at Oxford, and 8° at Nottingham.

Rainfall at the early part of the week was nil or nearly so generally, and very slight during the remainder.

Changeable weather was experienced during the remaining days of May. The sky was moderately clear on the 25th, 26th, 28th, and 29th; but on the other days the weather was generally cloudy or dull. Thunderstorms, accompanied by heavy rain, occurred at some places on the 26th, and again on the 28th.

Pressure was highest over France, or France and the southern English coast, until the 31st, when an area of high pressure was shown over the Baltic, while depressions were over our western coasts and the Gulf of Lyons.

Temperature varied very much, but was on the whole somewhat below the average for the time of year everywhere. At the beginning of the week high readings were reported from all parts of the United Kingdom, and in London and at Cambridge temperatures of 86° and 82° respectively were recorded on the 26th. Temp. stood much lower during the last few days of the month, the nights being very cold. The lowest reading, namely 30° in the shade, was recorded at Shrewsbury early in the morning of the 28th. On this occasion sharp ground frosts were experienced in many parts of England. The greatest deficit from the mean was 7°·3 at Churchstoke, 7°·2 at Shrewsbury, 6°·9 at Manchester, and 5°·3 at Pembroke. The only places at which the mean temp. was in excess of the average were Nairn and London, the former being 1°·0 above the mean, and the latter 0°·7.

Rainfall was less than the mean in S. England, and over Scotland; above it elsewhere. The greatest falls were 2·42 inches at Shrewsbury, 2·37 inches at Churchstoke, and 2·01 inches at Manchester; the slightest were 0·20 inch at Lowestoft, and 0·02 inch at Hastings.

Bright sunshine showed a decrease, except over S. and E. England and in the N. of Ireland. Maximum duration, 53 hours at Durham, 52 hours at Aberdeen and Southampton; minimum duration, 37 hours at Parsonstown, 36 hours at Llandudno, 34 hours at Churchstoke and Glasgow. The amount at Parsonstown is only 33 per cent., at Llandudno 32 per cent., at Churchstoke and Glasgow only 30 per cent. of the total possible duration.

*Lowestoft.* H. E. M.

## THE DRY PERIOD.

*To the Editor of the Meteorological Magazine.*

SIR,—The past eight months have been exceptionally dry at Bedford, and we appear still to be in a cycle of unusual atmospheric deviations from normal conditions. The altitude of this station is 115 feet above the level of the sea, and the average annual rainfall as recorded at Cardington (about 2 miles distant), by Mr. Maclaren, for 34 years is 22·39 inches. To show the evaporation, I also add the percolation through two feet and a half of pretty pervious soil, as measured by a gauge on the Dalton principle :—

| | Rainfall. in. | | Percolation. in. |
|---|---|---|---|
| 1879. | | | |
| October | 0·71 | ..... | 0·57 |
| November | 0·78 | ..... | 0·56 |
| December | 0·48 | ..... | 0·28 |
| 1880. | | | |
| January | 0·32 | ..... | 0·38 |
| February | 1·93 | ..... | 1·43 |
| March | 1·70 | ..... | 1·25 |
| April | 1·60 | ..... | 0·62 |
| May | 1·11 | ..... | 0·11 |
| | 8·63 | | 5·20 |

As the winter rains in a great measure supply the summer water, it is sure to be very scarce in many places, if the summer should be dry and hot.—Yours truly,

DAVID ROBIE.

*Bedford, 1st June,* 1880.

[From the above the rainfall, during the seven months, appears to have been only 60 per cent. of the average for the same period.—Ed.]

## THE HEAT OF MAY 26TH IN LONDON AND IN NEW YORK.

Somebody—Prof. Piazzi Smyth, we believe—used the term "Wave of Heat." As it implies nothing very definite and sounds well, we find that it has been extensively used, and we suppose that in future we shall not read of "Hot Periods" or "Hot Spells," as the Americans used to describe a period of high temperature, but the fashion will be to follow the suit of a London journal, and write of the "First Wave of Heat." However, if the heat will only come, it will matter little how it is described, but after the experience of 1879, we ought to be very thankful for all the sunshine we can get.

It is a very singular coincidence (which certainly ought to be cleared up by those who are watching the sun's surface in order thereby to predict the weather) that May 26th was excessively hot, both in London and in America.

We append two extracts from *The Times*, which we will leave without further comment, except that we believe that the Greenwich temperature of 87°·5 on May 26th was not merely, as is stated, the highest since 1841, but the highest there since 1793. In 1807 there was a reading of 84°·0 at Somerset House, which, perhaps, represents an equal temperature, and in 1868 the temperature at Greenwich on May 19th was 87°·0, but there is certainly no evidence of the temperature of 1880, May 26th, having been surpassed *at Greenwich.* At Camden Square, however, the figures, though not differing widely, are reversed, the maximum having been 87°·6 on May 19th, 1868, and 85°·1 on May 21st, 1870, while May 26th, 1880, gave only 85°·0.

### THE UNITED STATES.

(By Anglo-American Cables.)

The intense heat continues on the Atlantic coast, but a lower temperature is expected to-night. Thirty-two cases of sunstroke and six deaths occurred in New York on Thursday (27th). There have been five deaths from the same cause in Philadelphia, two in Jersey City, and two in Newburg, New York.

*Philadelphia, May 28th.*

First Wave of Heat.—The *New York Times* describes the last Tuesday and Wednesday in May as days of extraordinary heat in that city. "At 3 a.m. on the 26th the thermometer was at 74°, and it had reached 80° at 9 o'clock. At noon the mercury at the Signal Service station on Broadway, 140 ft. above the pavement, stood at 90° in the shade. The morning reports showed that the extreme heat prevailed over the entire country east of the Mississippi, with a slight exception in favour of the Gulf coast line." Cheyenne, at the foot of the Rocky Mountains, reported a temperature of 33°, or one above freezing; at Lowell, Massachusetts, it was 102°. At our own Royal Observatory, at Greenwich, the *maximum* on the 26th wrs 87·5°, which is higher than any reading recorded there since July 31st, 1877, and is the highest recorded in May in the 40 years, 1841–1880.

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## REVIEWS.

*Meteorological Observations made at the Adelaide Observatory during the year* 1878, *under the direction of* Charles Todd, C.M.G., F.R.A.S., *Postmaster General and Superintendent of Telegraphs.* Fcap. folio. Adelaide: E. Spiller, Government Printer.

This volume contains far more than the title indicates, and affords material for half-a-dozen articles. We think—considering the immense importance of the stations which Mr. Todd has established in the very heart of the Australian continent, the results of which are given in this volume—that in future the title should run, "Meteorological Observations made at the Adelaide Observatory, *and at the Second Order Stations in South Australia* during the year, &c."

We are rather surprised to find that Mr. Todd adopts the somewhat primitive arrangement of reduction to sea level by the application of a *constant* correction of +·154 in. for 140 ft. We find that

the air temperature at Adelaide ranged from 36° to 114° during the year. For these values the corrections for 140 ft. would be—

| | | | 30·578 | | 29·401 |
|---|---|---|---|---|---|
| Temp. ..... | 114° | ..... | ·140 | ..... | ·133 |
| ,, ..... | 36° | ..... | ·164 | ..... | ·154 |

We are glad to find that fortunately both extremes of pressure occurred with air temperatures between 50° and 55°. The real figures are, therefore, very nearly the same as those given by Mr. Todd. The following table shows the whole of the facts :—

| | As published. | Deduct the Constant. | Pressure at 140 ft. | Correction for 53° & 140 ft. | |
|---|---|---|---|---|---|
| Maximum pressure ... | 30·578 | —·154 | 30·424 | ·156 | 30·580 |
| Minimum ,, ... | 29·401 | —·154 | 29·247 | ·150 | 29·397 |

Although in this case the errors are only a few thousandths, the previous example shows that with the temperatures experienced at Adelaide it might amount to ·021 in., and as the use of a small table, very easily calculated from Mr. Scott's instructions or any similar work, would render the correction perfect, we have not a shadow of doubt that Mr. Todd will thank us for calling his attention to it, and adopt it from January 1st, 1881.

There are at the Adelaide Observatory two thermometer stands—one resembling Glaisher's, the other an octagonal wooden house with louvre roof and dwarf lattice side, and a stand to carry the thermometers, made something like a Glaisher's, but of painted canvass instead of solid wood. Mr. Todd says, "As a rule the thermometers on this stand do not rise so high as those on the Greenwich stand, but I am disposed to think that the results obtained are more reliable." We think so too; a full tabular comparison of the results on the two stands is given, and it seems to us clear that the thermometers on the Glaisher stand heat up unduly by radiation from the earth.

The observations are now in nearly all respects equal to those of the finest European stations. We do not attach much importance to the absence of a thermograph, but we should like to hear that a barograph, either a Redier or photographic, has been supplied. As regards radiation, both solar and terrestrial, the newest and best forms of instrument have been supplied, and Mr. Todd follows the very wise, but also rare, course of keeping the old instruments going as well as the new ones, and printing the values of both. This rule prevails throughout Mr. Todd's work, of which we can hardly give a better specimen than by quoting the paragraph referring to evaporation. We know of no European observatory where such judicious arrangements are in operation :—

EVAPORATION.—Atmometer No. 1 consists of a large box or tank, made of well seasoned red gum, lined with zinc; the tank is four feet square, and three feet six inches deep; it is sunk in the ground to a depth of nearly three feet, and is kept filled with water to within three or four inches of the top. The

observations are made in the following manner :—A stout brass bar is placed diagonally over one corner of the tank, resting horizontally on two iron plates; at right angles to this bar is a vertical rod, movable by rack and pinion, graduated to one-tenth of an inch, and read off by means of a fixed vernier to one-hundredth of an inch. The rod, which is pointed at its lower end, is carefully set to the water-level inside a glass tube of two-inch bore, reaching from the bottom of the tank, the lower end of the tube being perforated, by which means a perfectly smooth surface is secured, even in high winds. A rain gauge (No. 1090) by the side of the atmometer measures the rainfall received in the tank.

Atmometer No. 2 is sunk in the dome paddock. This consists—first, of a brick tank lined with cement; internal measurement four feet six inches square, and three feet two inches deep. Inside this tank is another made of slate, three feet square and three feet deep, leaving an intervening space between it and the larger tank of seven inches. Both tanks are filled to the same level, or to within three or four inches of the top, fresh water being added as required. The evaporation is measured by a graduated vertical rod, which is carried by a float placed in a vertical cylinder of copper three and a quarter inches in diameter (perforated at the bottom), standing in the inner tank. The rod is graduated to one-tenth of an inch, and is read off by a fixed vernier to one-hundredth of an inch. This atmometer was first used in August, 1877, and the following table shows the amount of evaporation indicated by both tanks in each month, from September, 1877, to 1878 :—

| | Old Tank. in. | New Tank. in. | Ratio. New Tank—Old Tank. in. |
|---|---|---|---|
| 1877. | | | |
| September | 3·169 | 2·661 | 0·840 |
| October | 5·549 | 4·965 | 0·895 |
| November | 7·086 | 6·416 | 0·905 |
| December | 9·663 | 8·739 | 0·904 |
| 1878. | | | |
| January | 12·265 | 10·250 | 0·836 |
| February | 7·980 | 6·714 | 0·841 |
| March | 7·500 | 6·220 | 0·829 |
| April | 4·126 | 3·575 | 0·867 |
| May | 2·262 | 2·145 | 0·948 |
| June | 1·772 | 1·702 | 0·960 |
| July | 1·829 | 1·672 | 0·915 |
| August | 2·869 | 2·348 | 0·818 |
| September | 3·900 | 3·393 | 0·870 |
| October | 6·126 | 5·445 | 0·889 |
| November | 8·358 | 7·117 | 0·852 |
| December | 10·204 | 8·219 | 0·805 |

From the commencement of 1878 the readings of the new tank have been adopted; but in the monthly results the total evaporation as shown by both atmometers is given, the reading of the old tank being used for comparison with previous years.

Considerations of space alone prevent our noticing other important items, but we must just mention before leaving the question of evaporation, that the amount in 1878 was 58·80 in. by the new tank, and 69·19 in. by the old one, the latter value being near the average given by the old instrument.

We must finally call attention to two notes, one upon observations of the upper currents of the atmosphere, and the other on the rate of progress of marked features in atmospheric pressure across Australia.

THE COBHAM JOURNALS. *Abstracts and Summaries of Meteorological and Phenological Observations made by* MISS CAROLINE MOLESWORTH, *at Cobham, Surrey, in the years* 1825 *to* 1850, *with Introduction, Tables, &c., by* ELEANOR A. ORMEROD, F.M.S. 8vo. London: Edward Stanford, 1880.

WE are not going into a psychical or theological disquisition, but there can be no harm in saying, that *if* those who have passed from us know anything of subsequent terrestrial matters, Miss Molesworth must have experienced an unusual degree of pleasure in watching the completion of the volume now before us.

But we must epitomize the history of the work, and after reading that epitome, and better still the book itself, we believe that all our readers will agree in the verdict which we have just indicated.

We need not stop long over the biography; we knew Miss Molesworth well during many years, and consider that Miss Ormerod gives a very life-like portrait; perhaps, if we were asked to give our own impressions, they would assume the form of a string of adjectives, in which we should certainly place brisk, brusque, incisive and kind. For fuller details the work must be referred to. Miss Molesworth at the age of 29, removed with her mother, Lady Molesworth, to Cobham Lodge, Surrey, in the year 1823, and at once started the meteorological and phenological register upon which the present work is based. It is not very easy to fully appreciate the difficulty of starting a series of meteorological observations in the early part of this century; years before any systematic record was started at Greenwich, or indeed at *any* observatory in the British Isles, and when not even blank forms for observations could be purchased. However, Miss Molesworth bought her instruments, and mounted them, read some of the best books then published, procured some thick quarto volumes of blank paper, ruled out a capital form of register and commenced her record. Miss Molesworth, like the majority of meteorological observers, lived beyond the ordinary three score years and ten, for she only died at the age of 78, leaving five of these thick volumes, the early ones especially, crammed with records of vegetable and animal life in addition to the usual meteorological data.

These volumes were by her wish presented by Sir Paul W. Molesworth, Bt., to the Meteorological Society—a course of action which we venture to commend for an example to others who may possess long continued MS registers. To search through, examine, and classify the mass of data in these volumes was such a labour, as few have the leisure and fewer still the courage to attack; but after a preliminary trial, Miss Ormerod undertook the task, and she has completed it in a manner which we cannot doubt will meet with universal approval.

We make no extracts, for if we did we should want to quote the whole chapter entitled Results of Observations; therefore, we leave

the work with one concluding remark, viz., that in our own mind the book classes along with Gilbert White's "Selborne;" it is a much more systematic and far less chatty book than White's, but each has its advantages, and we put the two side by side.

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## THE ATALANTA.

AT the meeting of the Meteorological Society on May 19th, Mr. G. J. Symons, F.R.S., president, in the chair, Messrs. T. H. Edmonds, F. Ekless, A. H. Taylor, and T. Turner were elected Fellows of the Society. A paper was read by Mr. C. Harding, F.M.S., on the Winds and Weather experienced in the North Atlantic between lats. 30° and 50° during February and March, 1880. This period includes the time during which Her Majesty's ship Atalanta was on her homeward passage, as she left Bermuda on January 31st. From the *data* collected it is shown that a gale blew in the Atlantic every day throughout the month of February, except on the 21st and from the 24th to the 27th. It appears probable that the Atalanta would not have met with any exceptionally severe weather earlier than about the 12th or 13th of February, and allowing that she had averaged from five to six knots per hour on her homeward course, she would on that date have inevitably encountered a severe hurricane. A heavy gale is noted on the 12th in lat. 38° N. and long. 45° W., which is in the direct homeward bound track from Bermuda; and if the Atalanta had averaged only four knots per hour on her homeward course she would fallen in with this gale. The storm of the 12th and 13th may fairly be deemed about the most severe during the two months of February and March. It may be remarked that the Norwegian barque Caspaei was north of Bermuda on the 3rd, and was in the full force of the gale on the 12th; her distance made, shows that the winds were favourable for a homeward passage from Bermuda. The correspondence from Her Majesty's ship Salamis, published in the *Times* of the 6th of May, states, on the authority of the captain of the Caspaei, that on February 12th, in lat. 42° 43′ N., long. 39° 25′ W., while running before the wind, he encountered the severest gale he had ever experienced. The ship would not steer, and could not be prevented from broaching-to. She was thrown on her beam-ends, and remained so for 19 hours, the cargo of cotton keeping her afloat. Several ships were in sight at the time of the commencement of the gale, and were unable to lay-to on account of its suddenness.

The following papers were also read:—"Variations in the Barometric Weight of the Lower Atmospheric Strata in India," by Prof. E. Douglas Archibald, M.A., F.M.S.; "On the Meteorology of Mozufferpore, Tirhoot, for the year 1879," by Charles N. Pearson, F.M.S. The Radiometer invented by D. Winstanley, was also exhibited. Its records were extremely delicate.

# SUPPLEMENTARY TABLE OF RAINFALL IN MAY, 1880.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | ... | XI. | Corwen, Rhug ..... | 2·16 |
| ,, | Margate, Acol ..... | ·15 | ,, | Port Madoc ..... | 2·21 |
| ,, | Littlehampton ..... | ·48 | ,, | Douglas..... | ·82 |
| ,, | St. Leonards ..... | ·07 | XII. | Carsphairn ... ..... | 2·62 |
| ,, | Hailsham ..... | ... | ,, | Melrose, Abbey Gate... | ·77 |
| ,, | I. of W., St. Lawrence. | ·37 | XIV. | Glasgow, Queen's Park. | 1·06 |
| ,, | Alton, Ashdell..... | ·19 | XV. | Islay, Gruinart School.. | 1·46 |
| III. | Great Missenden..... | ·23 | XVI. | Cupar, Kemback..... | ·91 |
| ,, | Winslow, Addington ... | 1·15 | ,, | Aberfeldy H.R.S. ..... | ·55 |
| ,, | Oxford, Magdalen Col... | ·77 | XVII. | Tomintoul..... | 1·12 |
| ,, | Northampton ..... | 1·08 | ,, | Keith H.R.S. ..... ..... | 1·57 |
| ,, | Cambridge, Merton Vil. | ·67 | ,, | Forres H.R.S. ..... | ·45 |
| IV. | Harlow, Sheering ..... | ·53 | XVIII. | Strome Ferry H.R.S.... | 2·58 |
| ,, | Diss ..... | ·59 | ,, | Auchnasheen H.R.S. ... | ... |
| ,, | Swaffham ..... | ·59 | ,, | Lochbroom ..... | 2·82 |
| ,, | Hindringham ..... | 1·09 | ,, | Tain, Springfield..... | ·56 |
| V. | Salisbury, Alderbury... | ·55 | ,, | Loch Shiel, Glenfinnan. | 4·53 |
| ,, | Calne, Compton Bassett | ·92 | ,, | Dalwhinnie H.R.S..... | ... |
| ,, | Beaminster Vicarage ... | 1·08 | XIX. | Lairg H.R.S. ..... | 1·94 |
| ,, | Dartmoor, Princetown.. | 1·39 | ,, | Altnabreac H.R.S. ..... | 1·50 |
| ,, | Langtree Wick ..... | 1·61 | ,, | Watten H.R.S. ..... | 1·18 |
| ,, | Lynmouth, Glenthorne. | 1·81 | XX. | Fermoy, Glenville ..... | 1·36 |
| ,, | St. Austell, Cosgarne... | 1·15 | ,, | Tralee, Castlemorris ... | 1·41 |
| ,, | Taunton ..... | 1·34 | ,, | Cahir, Tubrid ..... | ·89 |
| VI. | Bristol, Ashleydown ... | 1·29 | ,, | Tipperary, Henry St.... | 1·20 |
| ,, | Ross ..... | ... | ,, | Newcastle West ..... | 1·39 |
| ,, | Wem, Sansaw Hall..... | 1·15 | ,, | Kilrush ..... | 1·15 |
| ,, | Cheadle, The Heath Ho. | 2·65 | ,, | Corofin ..... | 1·29 |
| ,, | Bickenhill Vicarage ... | 1·73 | XXI. | Kilkenny, Butler House | ... |
| VII. | Melton Mowbray ..... | 1·44 | ,, | Carlow, Browne's Hill.. | ·75 |
| ,, | Horncastle, Bucknall... | 1·11 | ,, | Kilsallaghan..... | ·79 |
| VIII. | Walton-on-the-Hill..... | 2·24 | ,, | Navan, Balrath ..... | ·38 |
| ,, | Broughton-in-Furness .. | 2·59 | ,, | Athlone, Twyford ..... | 1·03 |
| IX. | Wakefield, Stanley Vic. | 2·38 | ,, | Mullingar, Belvedere ... | 1·36 |
| ,, | Ripon, Mickley ..... | 1·97 | XXII. | Ballinasloe ..... | 1·54 |
| ,, | Scarborough..... | 2·28 | ,, | Clifden, Kylemore ..... | 4·27 |
| X. | Mickleton..... | 1·83 | ,, | Crossmolina, Enniscoe.. | 2·15 |
| ,, | Haltwhistle, Unthank.. | 1·91 | ,, | Carrick-on-Shannon ... | 1·40 |
| ,, | Shap, Copy Hill ..... | 1·12 | XXIII. | Dowra ..... | 2·19 |
| XI. | Llanfrechfa Grange ..... | 1·74 | ,, | Rockcorry..... | ·89 |
| ,, | Llandovery ..... | 2·75 | ,, | Warrenpoint ..... | 1·03 |
| ,, | Solva ..... | 1·14 | ,, | Newtownards ..... | ·97 |
| ,, | Castle Malgwyn ..... | 1·90 | ,, | Carnlough..... | 1·43 |
| ,, | Rhayader, Nantgwillt.. | 3·15 | ,, | Bushmills ..... ..... | ·94 |
| ,, | Carno, Tybritle ... ..... | 2·71 | ,, | Buncrana ..... | 1·78 |

# MAY, 1880.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1860–5 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date. | Min. Deg. | Date. | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | Camden Square | ·26 | — 2·14 | ·21 | 31 | 5 | 85·0 | 26 | 33·8 | 1 | 0 | 5 |
| II. | | Maidstone (Hunton Court) | ·09 | — 2·15 | ·05 | 5 | 4 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss | ·56 | ... | ·22 | 11 | 9 | 79·1 | 26 | 28·3 | 1 | 4 | 11 |
| III. | | Hitchen | ·88 | — 1·05 | ·25 | 27 | 7 | 74·0 | 26 | 28·0 | 1 | 3 | ... |
| ,, | | Banbury | ·91 | — 1·31 | ·37 | 27 | 9 | 72·8 | 21 | 32·0 | 1 | 1 | ... |
| IV. | | Bury St. Edmunds (Culford) | ·43 | — 1·73 | ·12 | 4 | 8 | 84·0 | 26 | 28·0 | 18 | 2 | 7 |
| ,, | | Norwich (Cossey) | ·75 | ... | ·17 | 10 | 9 | 82·5 | 26 | 31·5 | 2 | 2 | 4 |
| V. | | Bridport | 1·13 | — ·90 | ·24 | 27 | 7 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple | 1·61 | — ·83 | ·73 | 26 | 8 | 73·0 | 21 | 38·0 | 9 | 0 | ... |
| ,, | | Bodmin | 1·36 | — 1·10 | ·59 | 26 | 8 | 75·0 | 21 | 35·0 | 1,2 | 0 | 3 |
| VI. | | Cirencester | ·82 | — 1·46 | ·23 | 27 | 8 | ... | ... | ... | ... | ... | ... |
| ,, | | Shifnal (Haughton Hall) | 2·43 | + ·17 | 1·33 | 26 | 8 | 67·0 | 21* | 31·0 | 1 | 1 | 2 |
| ,, | | Tenbury (Orleton) | 2·71 | — ·17 | 1·23 | 26 | 11 | 73·3 | 21 | 29·8 | 1 | 3 | 8 |
| VII. | | Leicester (Town Museum) | 1·63 | ... | ·41 | 11 | 15 | 69·2 | 26 | 32·1 | 1 | ... | 13 |
| ,, | | Boston | 1·19 | — ·75 | ·33 | 11 | 12 | 74·0 | 21 | 33·0 | 9 | ... | ... |
| ,, | | Grimsby (Killingholme) | 1·28 | ... | ·40 | 26 | 9 | 67·0 | 21* | 32·0 | 8 | 1 | ... |
| ,, | | Mansfield | 1·78 | ... | ·57 | 26 | 10 | 68·3 | 20 | 32·6 | 7 | 0 | 4 |
| VIII. | | Manchester (Ardwick) | 2·17 | — ·21 | 1·22 | 26 | 8 | 69·0 | 20 | 38·0 | 1 | 0 | ... |
| IX. | | York | 2·12 | + ·17 | 1·12 | 26 | 11 | 71·0 | 19 | 33·0 | 1 | 0 | ... |
| ,, | | Skipton (Arncliffe) | 3·17 | — ·18 | 1·35 | 23 | 11 | 74·0 | 20 | 31·0 | 6 | 2 | ... |
| X. | | North Shields | 1·32 | — 1·32 | ·64 | 26 | 13 | 65·0 | 19 | 34·7 | 8 | 0 | ... |
| ,, | | Borrowdale (Seathwaite) | 6·62 | — 2·92 | 4·14 | 23 | 12 | ... | ... | ... | ... | ... | ... |
| XI. | WALES. | Cardiff | 1·45 | ... | ·46 | 26 | 11 | 77·4 | 20 | 34·4 | 1 | 0 | ... |
| ,, | | Haverfordwest | 2·09 | — ·63 | 1·29 | 26 | 7 | 71·7 | 15 | 31·5 | 7 | 1 | 9 |
| ,, | | Aberdovey | ... | ... | ... | .. | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno | 1·78 | — ·60 | ·85 | 26 | 8 | 62·8 | 19 | 36·4 | 1 | 0 | ... |
| XII. | SCOTLAND. | Cargen | ·90 | — 1·53 | ·41 | 23 | 10 | 70·6 | 20 | 32·2 | 9 | 0 | ... |
| ,, | | Hawick (Silverbut Hall) | 1·31 | ... | ·28 | 10 | 12 | ... | ... | ... | ... | ... | ... |
| XIV. | | Douglas Castle (Newmains) | ·98 | ... | ·34 | 30 | 9 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Long (Arddaroch) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Kilmory | 1·96 | ... | ·58 | 30 | 11 | ... | ... | 30·0 | 7,8 | 5 | ... |
| ,, | | Mull (Quinish) | 2·14 | ... | ·56 | 30 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | | Loch Leven | 1·20 | — 1·00 | ·60 | 31 | 6 | ... | ... | ... | ... | ... | ... |
| XVII. | | Arbroath | ·80 | — 1·18 | ·28 | 30 | 6 | 72·0 | 19 | 36·0 | 5,9 | 0 | ... |
| ,, | | Braemar | ·62 | — 1·18 | ·15 | 24 | 10 | 69·2 | 21 | 27·5 | 9 | 7 | 16 |
| XVIII | | Aberdeen | ·86 | ... | ·40 | 28 | 11 | 68·0 | 19 | 33·0 | 4 | 0 | ... |
| ,, | | Portree | 2·97 | — 2·68 | ·76 | 25 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | | Inverness (Culloden) | ·55 | — 1·01 | ·18 | 24 | 7 | 67·5 | 19 | 31·5 | 4 | 1 | 11 |
| XIX. | | Dunrobin | 1·20 | — ·25 | ·25 | 23 | 13 | 62·0 | 20 | 32·5 | 3 | 0 | ... |
| ,, | | Sandwick | 1·66 | — ·60 | ·23 | 18 | 18 | 57·2 | 31 | 36·7 | 7 | 0 | 3 |
| XX. | IRELAND. | Cork | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Darrynane Abbey | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Waterford | 1·07 | — 1·18 | ·31 | 1 | 10 | 74·0 | 20 | 35·0 | 1 | 0 | ... |
| ,, | | Killaloe | 2·05 | — 1·13 | ·55 | 23 | 12 | 81·0 | 19 | 33·0 | 3 | 0 | ... |
| XXI. | | Portarlington | ·89 | — 2·31 | ·26 | 23 | 10 | 72·0 | 20 | 35·0 | 8 | 0 | ... |
| ,, | | Monkstown | ·65 | — 1·26 | ·18 | 31 | 8 | ... | ... | ... | ... | ... | ... |
| XXII. | | Galway | 1·30 | ... | ·29 | 29 | 16 | 71·0 | 18† | 39·0 | 5‡ | 0 | ... |
| XXIII | | Waringstown | 1·02 | ... | ·33 | 23 | 14 | 74·0 | 18 | 29·0 | 7 | 1 | 6 |
| ,, | | Londonderry | 1·46 | ... | ·26 | 30 | 17 | 67·0 | 9 | 34·0 | 8 | 0 | 4 |
| ,, | | Edenfel (Omagh) | 1·43 | ... | ·47 | 23 | 16 | 77·0 | 17 | 26·0 | 7 | 6 | 0 |

* And 26. † And 20. ‡ And 9, 13, 28, 29.

\+ Shows that the fall was above the average; — that it was below it.

# METEOROLOGICAL NOTES ON MAY.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—Notwithstanding cutting easterly winds and frosty nights, long hours of bright sunshine have so warmed the soil that a wholesome development of vegetation has taken place, and both wheat and spring crops are looking well. Lilac in flower on 2nd; horse-chestnut on 5th; monthly rose on 14th; pink may on 17th; and white clover on 29th. Turtle doves first seen on 6th; martins on 12th; swifts on 16th; cockchafer on 17th; and common blue butterfly on 23rd.

BANBURY.—Oak leafing early in the month, ash nearly at the end; very little blossom on the hawthorn; wheat looking remarkably well. A good deal of high wind in the latter part of the month. Hawthorn in bloom on 20th; H on 28th.

CULFORD.—A very dry month. Mean temp. 52°·5. Bar. very high on 29th and 30th. Polar winds prevailed during 21 days. Distant T on 26th.

COSSEY.—Wheat looking strong and healthy, though backward; grass in meadows very short.

BODMIN.—Severe drought; springs very low. Mean temp. 56°·1

CIRENCESTER.—A cold dry month; prevailing winds E. and N.E.

ORLETON.—The weather till the 23rd was generally fine and dry, with strong winds from N. and E., and very cold till after the 17th, when it was much warmer for a few days. On the 23rd the wind changed to S.W., and was followed with a cloudy sky and much R, a great but gentle fall occurring on the 26th and 27th. On the 3rd a TS from E. passed to S.E., accompanied by great darkness and a steady fall of R, and there was another steady fall of R on the 10th and 11th, so that, although a dry month, the rainfall was nearly the average. Mean temp. rather more than 1° below the average. Apple trees in blossom at the beginning of the month. First whitethroats and redstarts seen on 13th, but the number of summer birds is very small. Thrushes are rarely seen or heard; blackbirds are scarce, and even the robin has become a rare bird.

BOSTON.—The weather was generally fine and dry, too dry for the grass land, but very beneficial for cleaning arable land. Vegetation generally backward. Lilacs in flower about the 10th, and hawthorn and laburnums about the 23rd. Distinct solar halo between 9 and 10 a.m. on 13th. N.E. winds blew persistently for 16 days. Mean temp. 1°·4 below the average.

KILLINGHOLME.—Month cold and dry; prevailing wind E., but the prospects for the future are cheering. T on 28th.

SEATHWAITE.—Frosts at night at the beginning of the month, and warm days. A great deal of easterly winds in the middle of the month; storm on 23rd, with 4·14 in. of R.

## WALES.

HAVERFORDWEST.—From the 21st of April to the 25th of May, only ·45 in. of R fell, and easterly winds prevailed during the whole of that period, very strong at times, with bright sunshine and high day temperatures from the 13th to the 21st of May; but the nights, with few exceptions, were cold the whole month. Oak in leaf before the ash; both late. On the 26th a heavy rainfall took place, and the month ended showery and cold. The country looks remarkably well considering the drought.

LLANDUDNO.—The month was characterised by a large amount of sunshine, but the temp. was rather more than 1° below the average. The rainfall was very unevenly distributed, nearly all of it falling after the 25th. Grass and all other crops greatly freshened and improved by the R at the end of the month.

## SCOTLAND.

HAWICK.—E. winds prevailed from the 2nd to the 18th, and the rainfall was below the average; the fields would be greatly improved by a good soaking of

R, and unless it soon comes the hay crop will be light. Pear trees have very little blossom, and gooseberries were injured by frost on the 3rd.

QUINISH.—Bright sunshine, parching winds, and occasional frost at night from 1st to 18th; cold, stormy and showery from 18th to 28th; warm, with R, from 29th.

BRAEMAR.—A very dry month, with cold E. winds.

ABERDEEN.—Easterly winds prevailed till the 19th, followed by north-westerly and northerly till the 23rd, and south-westerly with occasional showers and milder weather till the 31st. Rainfall greatly below the average, but vegetation looks healthy and well advanced for the time of year. Squally on 24th, the wind occasionally reaching a strong gale in force in S. gusts. R and heavy H on 28th.

PORTREE.—A cold, frosty, dry month; pastures very backward.

CULLODEN.—Weather very dry from 1st to 9th and from the 11th to the 24th. Bar. very steady and high from the 4th to the 19th.

SANDWICK.—Generally a pleasant month. Rainfall and temp. nearly the average, but the farmers complain of the dryness. There was a gale of 50 miles an hour from 3 to 4 p.m. on the 24th, and one of 43 miles from 10 to 11 p.m. on 26th. Three peals of T on 27th and aurora on 1st.

## IRELAND.

KILLALOE.—Country white with S on the morning of the 3rd. Brilliant weather followed with N. winds, and the 19th was very warm. Meadows and pastures in want of R. Very little bloom on hawthorn and none on blackthorn.

MONKSTOWN.—The driest May since my record began in 1864, except 1871, when only ·35 in. fell. The early part of the month was characterized by cold, dry northerly and easterly winds from the 17th to the 21st; fine and warm H on 22nd.

WARINGSTOWN.—Very fine and dry, with hot sun, though the wind was sometimes cold and the nights frosty, but the sunshine has heated the ground as proved by the high readings of the ground thers., and the effects on vegetation is evident, growth being more luxuriant than the apparent atmospheric conditions would account for.

LONDONDERRY.—The mildest and dryest month for some time. Wind principally N.E. and S.W.

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## THE WEATHER.

NEVER have I known those tree proverbs more exactly verified—

"Oak before Ash,
Have a splash.
Ash before Oak,
Have a soak."

Here, in Mid-Surrey, we have had scarcely "a splash" of rain for weeks, and would almost welcome now a day or two of last year's ceaseless "soak."

There is another saying:—

"If the Oak before the Ash comes out,
There has been or there will be drought."

Our oaks all about are abundantly out in leaf, whereas the ash hardly makes a sign.

"As black as Ash buds in the front of May,"

sings Mr. Tennyson, that very close observer of nature; and black ash buds there may be, but not a sign of a leaf, while as for the roses "the survival of the fittest" proceeds merrily on.—*Journal of Horticulture, May 20th.*

SYMONS'S

MONTHLY

# METEOROLOGICAL MAGAZINE.

CLXXIV.] JULY, 1880. [PRICE FOURPENCE. *or 5s. per ann. post free.*

## WEATHER PREDICTION.

THE hot weather which Mr. Brumham expected to prevail at the end of June did not come, and some of our correspondents have made merry over the failure, and have blamed Mr. Brumham for making the prediction, and ourselves for printing it. Space is too valuable to be devoted to jokes, and we therefore print at the end of this notice only two letters, which are written in unexceptionable style, and which deal with facts.

We admit to the full the completeness of the failure, but we cannot understand the frame of mind which induces any meteorologist to see therein ground for rejoicing and merriment; to us it is quite the reverse.

It is our hope, and our belief, that besides the temporary purposes of civil life, to which they greatly minister, the meteorological observations now daily made at thousands of stations in all parts of the globe, will by a future and more deeply thoughtful generation be utilized for the investigation and determination of the probable character of coming seasons.

Such knowledge would be worth many millions of pounds per annum, and we think that those who without the remotest chance of personal recompense devote, as Mr. Brumham has done, weeks and months of their lives to seeking for this knowledge, deserve the sympathy and the support of those who wish well to their country.

There has been so much charlatanry about weather prediction, that it requires no ordinary courage to write anything upon the subject for publication, and it requires a little to publish such predictions, but the present utter failure does not in the slightest degree induce us to regret the space which during the last eleven years we have devoted to the subject. On the contrary, we ask our readers to carefully scrutinize the table on the next page, to examine all the original letters, to which we give full references; to test our description of the subsequent weather, and finally to say whether the following proportions are such as to call for the suppression of similar publications in future.

The table gives—

| | |
|---|---|
| Successes ..... | 9, or 65 per cent. |
| Partial successes ... | 2, or 14 per cent. |
| Failures..... .. | 3, or 21 per cent. |

or counting the partial successes, half with the successes and half with the failures, we have—

| | |
|---|---|
| Successes ..... | 10, or 71 per cent. |
| Failures..... | 4, or 29 per cent. |

Even if the successes can be reduced (and we do not think that they can, for we have tried to be impartial), there will still remain such a preponderance in favour of the predictions, that we have decided that if Mr. Brumham will in due course favour us with his opinion respecting the probable character of the winter of 1880-81, we will find room for the letter.

ANALYSIS.

| Published. | Spirit, or actual words of Prediction. | Subsequent weather at Greenwich. | Epitome. |
|---|---|---|---|
| 1869, May 15. Vol. IV., p. 59. | A period of a month or more of dry weather should commence in the latter part of May. | The total rainfall from May 28th to July 28th was 1·29 in., or less than half the average. | *Success.* |
| 1869, May 15. Vol. IV., p. 59. | Fine weather for harvest must set in on or about August 9th. | The total rainfall from Aug. 10th to Sep. 10th was 0·76 in., or less than half the average. | *Success.* |
| 1869, Sep. 15. Vol. IV., p. 134. | "When the moon's positions in declination have been the same as they will be in the coming *winter*, we have *always* had an unusually low temperature." | The mean temp. of Dec. 1869, and of Jan. and Feb. 1870, were all below the average. | *Success.* |
| 1870, Nov. 15. Vol. V., p. 179. | "According to a law which, since 1771, has *always* proved correct, the coming winter must be remarkably severe, that is, the mean temp. must be very considerably below the average." | The mean temp. of Dec. 1870 was 6° below the average ; Jan. 1871 was also very cold, and the mean of the two months lower than in any other year since 1830. | *Success.* |
| 1871, June 15. Vol. VI., p. 84. | The summer rainfall should be above the average, and the season unsatisfactory. | The rainfall was above the average both in June and July, and the temp. below it. August was fine and hot. | *Partial Success.* |
| 1871, Dec. 15. Vol. VI., p. 192. | "The winter should be somewhat warmer than the average." | Mean temp. of the three winter months 3° above the average. | *Success.* |
| 1871, Dec. 15. Vol. VI., p. 193. / 1872, Feb. 15. Vol. VII., p. 29. | The coming summer should be above the average. / The coming summer must be hot. | Mean temp. of June, July, and August, 1°·6 above the average. | *Success.* |
| 1872, Dec. 15. Vol. VII., p. 204. | The winter on the whole must be an average one, but the mean temp. of February will probably be below the average. | Mean temp. of the three winter months 1° above the mean of 50 years, and just that of the last 25 years. The mean of Feb. was 4°·7 below the average. | *Success.* |

ANALYSIS—*(continued.)*

| Prediction. | Spirit, or actual words of Prediction. | Subsequent weather at Greenwich. | Epitome. |
|---|---|---|---|
| 1873, May 15. Vol. VIII. p. 68. | The mean of the summer months should be below the 50 year average, but with considerable heat at the end of July or the beginning of August. | Mean of June just the average, July and August both above it, of the three months rather above it. July 21st to 23rd excessively hot. | *Partial Success.* |
| 1873, Dec. 15. Vol. VIII. p. 179 | Winter will be rather severe, mean temp. below that of the last 33 years. | Mean temp. was rather (about 1°) above the 33 year mean. | *Failure.* |
| 1873, Dec. 15. Vol. VIII. p. 179 | Summer will probably be cool, cooler than 1873. | Temp. just the average, and 1° cooler than 1873. | *Success.* |
| 1874, Dec. 15. Vol. IX., p. 163. | The coming winter will be, at any rate, partly very severe. | Mean temp. of Dec. 7°·1 below 33 years mean, and of the three months 2°·1 below it. | *Success.* |
| 1875, Dec. 15. Vol. X., p. 174. | The coming winter should be a very severe one. | Some spells of severe weather, but the mean only 0°·3 below the average. | *Failure.* |
| 1880, May 15. Vol. XV., p. 56. | Very great heat should occur in the last three weeks of June. | Mean temp. just the average, and no extreme heat. | *Failure.* |

*To the Editor of the Meteorological Magazine.*

SIR,—Being one of the numerous sceptical individuals referred to in Mr. Brumham's letter in the *Meteorological Magazine* for May last, I have, according to his request therein stated, carefully watched the weather of last month, and so far as this locality goes, the results have been contrary to Mr. Brumham's confident expectations.

Instead of bringing with it "great heat," the month of June, 1880, will be chronicled as having had a mean temperature 2° to 3° *below* the average. The lunar theory, after all then, is not to be depended upon.—Yours very truly,

H. COLBORNE.

*St. Leonard's, July 1st*, 1880.

*To the Editor of the Meteorological Magazine.*

SIR,—In a letter which appeared in your May number, your correspondent, Mr. Brumham, writing from Barnsbury, under date of April 30th, says, "according to a lunar law, to which I have frequently called attention, a wave of unusually great heat should pass over this part of England in the last fortnight or three weeks of June next."

As Mr. Brumham, in the same letter, pointedly invites the attention of your readers to his prediction, and asks them "to carefully watch the weather," in order to test the value of his lunar theory, he will not, I trust, think me ungracious if I point out that during the whole of the period in question the temperature all over England was below the average, and the weather unsettled and showery, with very heavy local thunderstorms in the last week.

From the official weekly summaries issued by the Meteorological Office, it appears that the mean temperature for the week ending June 14th was as much as 6° *below* the average in the E., S.W., and Midland districts, and 5° below in the N.W., N.E., and S. districts, while in the two following weeks the deficiency of temperature varied between 3° and 1°, the only exception being in the N.W. district, where the mean temperature for the week ending June 21st just equalled the average. And it further appears that at no single one of the fifty and odd British stations from which the official statistics are gathered, did the maximum temperature in shade even once rise to 80° during the three weeks in question, while at several stations it did not even touch 70°. In a word, the period referred to in Mr. Brumham's communication, instead of being one "of very great heat, or of remarkably fine warm summer weather," has been characterized throughout the whole of England, and especially in that part of it to which Mr. Brumham's forecast more particularly refers, by cloudy skies, deficiency of temperature, and excess of rainfall.

I will not now further trespass on your space, except to express my profound distrust of weather predictions based on "lunar" and other "laws of the weather" such as that enunciated by Mr. Brumham, and indeed of all weather predictions which overpass the limits of the modest official "forecasts." But I hope, with your permission, to return to this subject, and, in a future number of your magazine, to give some reasons for my scepticism.

I am, Sir, yours, &c.,

G T. RYVES, F.M.S.

*Tean Vicarage, Stoke-on-Trent, July 7th*, 1880.

[We shall be happy to receive the communication herein offered. —ED.]

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## THE METEOROLOGICAL SOCIETY.

The last ordinary meeting of this society for the present session was held on Wednesday, the 16th ult., at the Institution of Civil Engineers, Mr. G. J. Symons, F.R.S., president, in the chair. T. W. Barry, M.D., A. W. Martin, and C. E. Peek were elected Fellows, and Senor A. Aguilar and Dr. H. H. Hildebrandsson were elected Honorary Members of the Society.

The following papers were read :—

1. "Ozone in Nature, its Relations, Sources, and Influences, &c." from 15 years' observations ashore and afloat, under all conditions of climate, by J. Mulvany, M.D., R.N.—The Meteorological elements with which ozone is most intimately associated are such as occasion high vapour tension and a high degree of saturation : therefore it is promoted by wind passing over a large aqueous expanse, and by heat producing rapid evaporation. Hence heat, if humid, is no bar to atmospheric ozonisation, but no definite relation exists in the

atmosphere between heat *per se* and ozone; its relation to humidity is more definite and direct, but subject to many exceptions; in consequence of this relation, it most abounds where its chemical qualities render it most useful. It appears to be formed in the upper strata and to be carried downwards by rain drops whose office is vehicular. The spherules of water which constitute clouds and have their origin in radiation and condensation have a similar office. Ozone does not appear to diffuse readily downwards, so that when the lower strata are robbed of ozone, by jungle, &c., a considerable difference in the ozonic condition close to, and at 170 ft. above, the surface may exist. The author is of opinion that no disease can be clearly traced to ozone as met with in the atmosphere.

2. "The Average Height of the Barometer in London." By Henry Storks Eaton, M.A., F.M.S.

3. "Note on a Waterspout observed at Morant Cays, Jamaica, March 23rd, 1880." By Lieut. Alfred Carpenter, R.N., F.M.S.

4. "Account of a Balloon Ascent from Lewes in a Whirlwind, on March 23rd, 1880." By Capts. James Templer and H. Elsdale.

5. "Results of Meteorological Observations made at Stanley, Falkland Islands, 1875-77." By William Marriott, F.M.S.

6. "A New Thermograph." By William David Bowkett.

7. "The Winter Climate of Davos." By C. T. Williams, M.D., F.M.S. Among the high altitude sanitaria of Europe, Davos at present enjoys the greatest reputation, partly on account of its accessibility and partly on account of certain peculiarities of position and shelter. The valley of Davos lies in the canton of the Grisons, between the valleys of the Lower Rhine and the Upper Engadine. The valley runs from N.N.W. to S.S.E., for about ten miles in length, with an average breadth of about a third of a mile, being for the most part of this extent a plain, gently sloping towards the north, and varying in elevation from 5400 to 4500 feet. Davos Platz is 5105 feet above the sea level. The author discusses the observations made during the four winters of 1876-7 to 1879-80. The peculiar effects of Davos Winter Climate seem to depend on—1. The rarefaction of the atmosphere; 2. Its dryness; 3. The absence of strong currents, owing partly to shelter, and partly to the uniform layer of snow spread around; and 4. The large percentage of the *direct* solar rays reaching the locality owing to the rarefaction of the air, and also the considerable amount of heat reflected from the extensive snow plain in front of the village of Davos Platz.

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## ERRATA IN THE TABLES OF MONTHLY RAINFALL IN *METEOROLOGICAL MAGAZINE*, VOL. XIV.

In our last volume the monthly fall of rain was given for one hundred and thirty-eight stations; there were, therefore, about 1600 monthly values printed. These have now all been checked against the annual returns from the same stations, previous to their publica-

tion in *British Rainfall*, 1879, and the following 18 errors have been detected. This is far too many; both our readers and ourselves are so much indebted to the observers who furnish these returns that we are reluctant to state what proportion of these 18 errors belongs to our correspondents, and what to ourselves. It is impossible for us to be more careful than we are; we trust that our observers will be equally anxious to avoid appearing in the corresponding list next year.

| Page. | Month. | Station. | Wrong. in. | Right. in. |
|---|---|---|---|---|
| 10 | Jan. | Hastings | 2·59 | 3·77 |
| ,, | ,, | Strathfield Tur. | 3·24 | 3·63 |
| 11 | ,, | Warrenpoint | 4·35 | 4·32 |
| 28 | Feb. | Unthank Hall | 2·55 | 2·52 |
| 46 | Mar. | Galway | 2·16 | 2·53 |
| 55 | Apr. | Douglas | 2·18 | 2·11 |
| 77 | May | Carno | 2·07 | 2·35 |
| ,, | ,, | Dowra | 2·85 | 2·89 |
| 78 | ,, | Arncliffe | 2·08 | 2·03 |
| 94 | June | Loch Leven | 5·00 | 5·10 |
| 117 | July | Cahir | 2·10 | 2·30 |
| 118 | ,, | Loch Leven | 4·10 | 4·70 |
| 165 | Oct. | Crossmolina | 2·88 | 2·93 |
| ,, | ,, | Dowra | 3·10 | 3·04 |
| 182 | Nov. | Culloden | 2·74 | 2·79 |
| 184 | ,, | Tralee | ·50 | ·68 |
| 194 | Dec. | York | 1·24 | 1·12 |
| ,, | ,, | Galway | 3·13 | 3·22 |

## THE WEATHER IN JUNE.

Generally overcast and very showery weather prevailed over England during the first week of June, while in Ireland and Scotland it was moderately fine.

Atmospheric pressure which had been high in the northern half of Western Europe during the first two days of the month, gave way very rapidly on the 3rd, upon the advance of two large depressions from the Atlantic—one to the north of Scandinavia, the other to Northern Germany; the anticyclone shifting to the westward. On the 5th a fresh depression appeared in the north, and pressure decreased everywhere except over the south-western coast of these islands. On the 7th this depression extended from the Shetlands to the western shores of the Baltic; thus causing the area of high pressure to move southwards until it was over the south-west of France, and north coast of Spain.

Temperature was less than the average throughout these Islands. The largest deficit from the mean was 7°·5 at Rothamsted and Churchstoke, and 7°·2 at Birmingham; the nearest approach to the mean was in the south of Ireland. The highest of the maxima (72° at Barrow-in-Furness, and 71° at Glasgow) occurred on the 3rd. Low min. readings were registered in all districts: during the early morning of the 5th the min. in the shade fell to about 35° in nearly all parts of Great Britain; at many inland towns sharp ground frosts were experienced.

Rainfall more than the mean except in S.W. England, W. Scotland, and S. Ireland.

Bright sunshine showed a decided decrease in England, but a slight increase in Scotland and Ireland. The duration varied from 73 hours at Glasgow, and 69 hours at Glenalmond, to 23 hours at Cambridge, 22 hours at Churchstoke, and 19 hours in London. The value for London is only 17 per cent. of the total possible duration.

Rather cloudy, and sometimes very dull and very showery, weather characterized the following week (8th–14th). Thunderstorms were reported from several towns both at the beginning and close of the week.

The above-mentioned anticyclone, with slight modifications and alteration of position from day to day, held good over France until the 14th, when it shifted to over Ireland, while a shallow depression succeeded to its place. The depression over Scandinavia (above-mentioned), gradually became shallower, finally disappearing on the 11th. Readings were extremely uniform over Western Europe on the 10th; indeed, on no day was the variation of pressure greater than half an inch.

Temp. again below the mean over the whole of these Islands. In E. Scotland the deficit was only 2°, but from 5° to 7° elsewhere. The ther. was for the most part highest on the 12th or 13th, when 75° was recorded at Nottingham and Cambridge; the minimum took place on the 9th or 10th.

Rainfall a little above the average in N.E. and N.W. England, and over Ireland; equal to the mean in S.W. England; a little less than the average elsewhere. The largest falls were 2·01 inches at Valentia and 1·50 at Markree Castle; the slightest were 0·08 inch at Birmingham and 0·13 at Cambridge.

Bright sunshine was of longer duration than in the previous week, except in Scotland, whence a decrease was reported. Max. duration, 75 hours at Valentia, and 72 hours at Markree Castle; min. duration, 35 hours at York, and 31 hours in London.

The sky was very cloudy and the weather very changeable, except in Scotland and the extreme North of England during the next week (15th–21st).

In the morning of the 15th a depression appeared over N. Germany and advanced in a westerly direction till, on the 16th, it was over the Straits of Dover. Consequently the bar. fell over nearly the whole of these Islands and France, while in the countries to the eastward of the North Sea a recovery began. By the following day the depression had travelled away in a S.W. direction to the Bay of Biscay, and the bar. rose over the whole of Europe. Next day it fell over the whole of W. Europe, but there was little difference in the general distribution of pressure.

On the 20th a depression advanced from the Atlantic to the S.W. coasts of these Islands, and several shallow subsidiary depressions lay over Ireland, W. and S. England; the weather being very showery and cloudy generally, except in the Netherlands and Scandinavia. Next day the bar. was changing rather irregularly; rising in the east of France, the Netherlands, and the greater part of England; falling elsewhere. Readings were rather low over W. Europe generally, and especially over our western coasts.

Temp. was slightly above the average in N. Ireland and W. Scotland, equal to it in N. Scotland and N.W. England; but elsewhere less than the average. The max. was 78° at Manchester, 76° at Nottingham, Cirencester, and Ardrossan; the min., 37° at Silloth and Markree Castle.

Rainfall less than the mean in Scotland, equal to it in S.W. England, below it elsewhere. Heaviest falls, 1·92 inches at Hurst Castle, and 1·52 at Hereford; lightest fall, 0·03 inch at Nairn, and 0·09 at Glasgow.

Bright sunshine showed a decrease, except in Scotland. Max. duration, 66 hours at Glasgow, and 58 at Glenalmond; min. duration, 26 hours at Cirencester, and 23 hours at Falmouth.

Changeable weather distinguished the last week of the month. Heavy thunderstorms occurred over the Midland and Eastern Counties on the 22nd, 23rd, and 24th, and in the South on the 25th and 26th. A good deal of fog was reported from Scotland on the 22nd and 26th.

On the 22nd barometric readings were very uniform over the British Isles, but an area of high pressure was shown over Spain, and an area of low pressure over Lapland. Next day the bar. fell decidedly in western France, but rose elsewhere, except in the Netherlands and the east of France, where it rose. Pressure remained highest in the south-east of France. A depression advanced to the extreme north of Scandinavia on the 26th, and one of lesser dimensions to France. The advance of the latter depression caused a total break-up of the anticyclone over France; and one was established over Ireland, where pressure increased rapidly. During the following day (27th), a large depression advanced to the north of Scotland, so that a brisk fall of the bar. began in Norway. Over France and the greater part of these Islands, however, the mercury rose, a large anticyclone being formed over France and the Channel. The centre of the depression moved deliberately from the Shetlands to Norway on the 29th, while the area of high pressure shifted somewhat to the eastward, and became less marked. The bar. fell a little, very generally on the 30th, and both depression and anticyclone had in great measure disappeared.

Temp. during the last ten days of the month was slightly above the average in Scotland, but below it in England and Ireland. The highest temp. occurred in N.E. England, some parts of the Midland Counties, and W. Scotland on the 22nd, but in the southern part of England it was registered towards the close of the period. The minimum was 42° at Glenalmond, and 43° at Durham and Cirencester.

Rainfall rather less than the mean in E. Scotland, N.E. and S.W. England, about equal thereto in S. Ireland, above it elsewhere. The heaviest falls reported were 3 inches at Nottingham, 2·01 inches at Laudale, and 1·99 at Oxford. At Leith, Pembroke, Barnstaple, and Plymouth, the total fall was less than one-tenth of an inch.

Bright sunshine was in the Midland Counties, S. and S.W. England, more frequent than in the week immediately preceding, but elsewhere there was a considerable decrease. Maximum duration, 61 hours at Pembroke ; minimum duration, 14 hours at Armagh, 16 hours at Dublin, at York 18 hours, and at Durham 19 hours.

*Lowestoft.* H. E. M.

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## PHENOLOGICAL OBSERVATIONS, 1879.

*Extracted from the records sent along with the returns of the fall of rain.*

JANUARY.

17th. (II.) *St. Lawrence.* Winter aconite in flower.

FEBRUARY.

5th. (II.) *St. Lawrence.* Snowdrops in bloom.

6th. (II.) *St. Lawrence.* Thrush and blackbird heard.

16th. (II.) *St. Lawrence.* Yellow crocus in bloom.

18th. (II.) *Eastbourne.* Primroses first seen.—(II.) *St. Lawrence.* Peacock butterfly seen.

MARCH.

1st. (II.) *Littlehampton.* Blackbird first heard.

3rd. (II.) *Addiscombe.* Yellow crocus in flower.

5th. (III.) *Cambridge, Merton Villa.* Sulphur butterfly seen.

6th. (II.) *Addiscombe.* A double snowdrop in flower.—(II.) *St. Lawrence.* Gossamer spider web abundant.—(IV.) *Diss.* First wild primrose.

8th. (IX.) *Stanley Vicarage.* Crocus in flower and bees out.

10th. (II.) *St. Lawrence.* Peacock, tortoiseshell, and white butterflies seen.

13th. (IX.) *Stanley Vicarage.* Thrushes singing in trees covered with snow.

21st. (II.) *Addiscombe.* An early apricot on a south wall in flower, 17 days later than in 1878.—(II.) *St. Lawrence.* Gooseberries in leaf.

22nd. (II.) *St. Lawrence.* First cowslips.

31st. (II.) *Addiscombe.* A Pyrus japonica on an east wall in flower.

APRIL.

4th. (I.) *Pinner Hill.* Swallows first seen.

5th. (II.) *St. Lawrence.* Pair of swallows seen.

7th. (XII.) *Melrose.* Apricot blossom out.

10th. (II.) *Addiscombe.* A peach, and also a nectarine, on a south wall in flower.

15th. (II.) *St. Lawrence.* Nightingales singing.

16th. (III.) *Addington.* Cuckoo heard.—(XII.) *Melrose.* Cherry blossom out.

17th. (V.) *Alderbury.* Cuckoo heard.—(VII.) *Langton.* Cuckoo seen.

18th. (I.) *Pinner Hill.* Cuckoo heard.—(II.) *St. Lawrence.* Wryneck heard.—(XX.) *Newcastle West.* First swallows seen.

19th. (I.) *Pinner Hill.* Wryneck heard.—(III.) *Addington.* Swallows seen.—(IX.) *Stanley Vicarage.* Cuckoo heard.

20th. (II.) *Addiscombe.* A polyanthus in a north border in flower, nearly 2½ months later than in 1878.—(III.) *Cambridge.* Swallows seen.—(IV.) *Diss.* Cuckoo and nightingale heard.

21st. (IV.) *Diss.* Swallow seen.

22nd. (II.) *St. Lawrence.* Cuckoo heard.—(VII.) *Coston.* Cuckoo first heard.

23rd. (V.) *Alderbury.* Nightingale heard.

24th. (III.) *Cambridge.* Nightingale and cuckoo heard.—(V.) *Alderbury.* Swallow seen.

25th. (XII.) *Melrose.* Swallows first seen.

26th. (I). *Pinner Hill.* Nightingale heard.—(II.) *St. Lawrence.* Stellaria in bloom.

27th. (VI.) *Cheltenham.* Cuckoo heard.—(VII.) *Langton.* Swallow seen.

28th. (II.) *St. Lawrence.* Blackthorn in bloom.—(VI.) *Sansaw.* Swallows first seen.

30th. (II.) *Addiscombe.* A single wallflower in a north border in flower, quite 3½ months later than in 1878.

MAY.

2nd. (II). *St. Lawrence.* Blue bells in flower.

5th. (II). *Hythe.* Swifts arrived.—(II). *St. Lawrence.* Pears in bloom.

8th. (II). *Addiscombe.* Single gorse in flower.

12th. (II). *Addiscombe.* An espalier pear-tree and a morello cherry-tree on a north wall in flower.—(X). *East Layton.* First swallow seen.

15th. (II). *St. Lawrence.* Swifts seen.

17th. (IX). *Stanley Vic.* Landrail first heard.

19th. (II). *St. Lawrence.* Purple lilac in bloom.—(X). *East Layton.* Whitethroats seen.

21st. (II). *St. Lawrence.* First swarm of bees.

23rd. (X). *East Layton.* Flycatchers arrived.

24th. (II). *St. Lawrence.* First piece of May in bloom.

27th. (II). *St. Lawrence.* Damsons in bloom.

JUNE.

2nd. (II). *Addiscombe.* Purple lilac in flower.

4th. (V). *Babbacombe.* Immense numbers of the painted lady butterfly were seen about the 4th, but were in bad condition.

28th. (II). *St. Lawrence.* Grass cut for hay.

30th. (VI). *Cheltenham.* Currants on wall only just ripening.

JULY.

3rd. (II). *Addiscombe.* One of my roses, a Blairii, came first into bloom, or more than five weeks later than in 1878. Syringa in flower.

10th. (II). *Addiscombe.* Honeysuckle in flower.

17th. (II). *Addiscombe.* Privet in flower.

AUGUST.

15th. (II). *Addiscombe.* Every leaf on the whole of the white and red currant and gooseberry bushes in my garden had before this date been eaten up by the gooseberry-caterpillar.

SEPTEMBER.

8th. (II). *Addiscombe.* A sedum spectabile in flower.

13th. (II). *Addiscombe.* First ripe peach picked from a south wall.

20th. (V). *Babbacombe.* Harvest completed.

OCTOBER.

11th. (IV). *Diss.* Harvest generally over.

NOVEMBER.

4th. (II). *Addiscombe.* Cut 23 rose-blooms, two of which were as fine as any I have gathered this year.

7th. (IX). *Wakefield, Stanley Vic.* Beautiful day; starlings singing.

13th. (II). *Addiscombe.* Minimum temperature, 33°·0, and on grass 23°·6; all my dahlias killed; more than a fortnight earlier than in 1878.

14th. (II). *Addiscombe.* Minimum temperature, 27°·5, and on grass 16°·2. Flowers of a Gladiolus Brenchleyensis destroyed.—(X). *East Layton.* Peaches still on the tree, and Gloire de Dijon and sweet scented clematis in bloom.

16th. (II). *Addiscombe.* Minimum temperatures, 21°·2, and on grass, 12°·4 All my everlastings (helichrysums) fell victims to this frost.

17th. (II). *Addiscombe.* Cut the last rose of the year, or nearly three weeks later than in 1878.

18th. (II). *Addiscombe.* A Christmas rose in a north border in flower.

DECEMBER.

15th. (IX). *Stanley Vic.* Starlings singing.

## REVIEW.

*Results of Meteorological Observations made at the Bath Royal Literary and Scientific Institution during Ten Years commencing March,* 1865. By the Rev. L. BLOMEFIELD, M.A., F.L.S., &c. (From the Proceedings of the Bath Natural History and Antiquarian Field Club). Vol. iii., No. 3. Bath: 1876.

THE author of this work has kept a Meteorological Register since 1823, and in 1858 published (as the Rev. L. Jenyns, which name he has since change for Blomefield) an octavo volume of 400 pp., giving the results of nineteen years' observations at Swaffham Bulbeck, in Cambridgeshire; he is also the author of several works on Natural History and kindred subjects.

At the meeting of the British Association at Bath in 1864, the author made some remarks on the Climate of Bath, and as he con-

sidered that none of the meteorological records which had been kept in the town was altogether trustworthy, he proposed to the Committee of the Literary Institution that a series of observations should be made at the Institution, and this work is a discussion of the records obtained from instruments which were soon afterwards procured. The work commences with an account of the published descriptions of the Climate of Bath, which appear to be rather scanty, and refers to the very contradictory terms in which the climate is frequently spoken of. This is followed by a thorough description of the instruments, their position and exposure, which appear to be perfectly satisfactory, with the exception of the rain gauge, which is 8 ft. above ground, and the barometer an old one by Cary, the readings of which are only referred to slightly, as they are not considered satisfactory, and in 1875 it was replaced by a Fortin made by Casella.

The tables of temperature do not call for special description, but they seem complete, not only giving the means and extremes of the months and the seasons, but also a comparison with the temperatures of some half dozen other towns, from which the author concludes that Bath is warmer in winter than those towns, about the same temp. in summer, and that all through the year the variations of temperature are much less rapid, and the extremes not so great as at other places.

Rainfall, humidity, and the direction of the wind are also dwelt upon at some length, and there are several pages on ozone and the general quality of the air. The author concludes by suggesting that additional registers should be kept in different parts of the town at various altitudes—a suggestion with which we cordially agree, for few cities have probably a greater variety of climate within a radius of two miles than has Bath.

## THE OAK AND THE ASH.

*To the Editor of the Meteorological Magazine.*

SIR,—You give in your June number a Mid-Surrey tree proverb, viz. :—

"If the oak before the ash comes out,
There has been or there will be drought."

Allow me to add the Cheshire version :—

"If the oak comes out before the ash,
There'll be no water for to wash."

which smacks much of the country housewife.—I am, yours,

EDWARD CHAPMAN.

*Frewen Hall, Oxford, 30th June,* 1880.

[Other versions are :—

"If the ash is out before the oak,
You may expect a thorough soak ;
If the oak is out before the ash,
You'll hardly get a single splash."

"When the oak comes out before the ash, there will be fine weather in harvest ; but when the ash comes out before the oak, the harvest will be wet."

"If the oak's before the ash,
Then you'll only get a splash ;
But if the ash precedes the oak,
Then you may expect a soak."

The following note appeared in *Land and Water*, on Nov. 2nd, 1872 :—

SIGNS OF RAIN.—SIR,—The subjoined extract was given to me a year ago, but I cannot tell when it was written. You will see that some of the years occur in more than one of the lists. I have marked these with (?)

When the ash comes out before the oak,
You may look for a soak.
When the oak comes out before the ash,
You may expect a splash.

In the years 1816, 17, 21, 23, 28, 29, 30, 38, 40 (?), 45, 50, and 59, the ash was in full foliage more than a month before the oak, and many of our readers will recollect the cold and unproductive seasons which succeeded. Again, in 1831, 33 (?), 39, 40 (?), 53, and 60, both these species of vegetation began their race about the same period, and the summers which followed were neither one way nor the other. Whereas in 1818, 19, 20, 22, 24, 25, 26, 27, 33 (?), 34, 35, 36, 37, 40 (?), 42, 46, 54, and 68, the oak displayed its foliage weeks before its companion of the forest, and these years were particularly distinguished for fine dry and mild weather, and subsequently by the most abundant harvest recorded.—*Mark Lane Express.*

This year the oak was in leaf at least a month before the ash. So much for the old "saw."—H. T.

One of our old rainfall correspondents, Mr. Douglas, of Babworth, Notts, once told us that "the oak is always in leaf before the ash *when the subsoil is in a moist state.*"—ED.]

## THE DRY PERIOD.

*To the Editor of the Meteorological Magazine.*

SIR,—The exceptional drought of the past eight months, to which Mr. Robie calls attention, has not been confined to his neighbourhood, the following figures showing the rainfall to have been still less here, at Beckenham.

| Month. | Total Depth. | Number of days on which 0·01 or more fell. | Greatest Fall in 24 hours. | |
|---|---|---|---|---|
| 1879. | inches. | | Depth. | Date. |
| October ..... | ·541 | 7 | ·233 | 24th |
| November ..... | 1·159 | 12 | ·400S | 21st |
| December ..... | ·925 | 11 | ·382 | 30th |
| 1880. | | | | |
| January ..... | ·339 | 5 | ·171 | 16th |
| February ..... | 2·308 | 17 | ·488 | 16th |
| March ..... | ·542 | 5 | ·308 | 31st |
| April ..... | 1·826 | 12 | ·499 | 14th |
| May..... | ·442 | 4 | ·250 | 31st |
| | 8·082 | 73 | | |

It will be noted that, excluding February and April, only 3·944 fell in the other six months, the greatest amount being ·400 (snow) on 21st November.—I am, yours faithfully, PERCY BICKNELL.

*Foxgrove, Beckenham, 17th June*, 1880.

# SUPPLEMENTARY TABLE OF RAINFALL IN JUNE, 1880.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 3·60 | XI. | Corwen, Rhug ..... | 3·63 |
| ,, | Margate, Acol ..... | 2·91 | ,, | Port Madoc ..... | 4·04 |
| ,, | Littlehampton ..... | 1·61 | ,, | Douglas..... | 2·20 |
| ,, | St. Leonards ..... | 3·13 | XII. | Carsphairn ..... | 2·78 |
| ,, | Hailsham ..... | 2·61 | ,, | Melrose, Abbey Gate... | 1·40 |
| ,, | I. of W., St. Lawrence. | 1·98 | XIV. | Glasgow, Queen's Park. | 2·10 |
| ,, | Alton, Ashdell..... | 2·16 | XV. | Islay, Gruinart School.. | 2·49 |
| III. | Great Missenden..... | 2·23 | XVI. | Cupar, Kemback..... | 1·90 |
| ,, | Winslow, Addington ... | 2·26 | ,, | Aberfeldy H.R.S. ..... | 1·61 |
| ,, | Oxford, Magdalen Col... | 4·18 | XVII. | Tomintoul..... | 4·79 |
| ,, | Northampton ..... | 2·07 | ,, | Keith H.R.S. ..... ..... | 2·10 |
| ,, | Cambridge, Merton Vil. | 2·78 | ,, | Forres H.R.S. ..... | 1·20 |
| IV. | Harlow, Sheering ..... | 1·78 | XVIII. | Strome Ferry H.R.S.... | 2·33 |
| ,, | Diss ..... | 3·95 | ,, | Auchnasheen H.R.S. ... | ... |
| ,, | Swaffham ..... | 5·53 | ,, | Lochbroom ..... | 4·50 |
| ,, | Hindringham ..... | 3·23 | ,, | Tain, Springfield..... | 1·80 |
| V. | Salisbury, Alderbury... | 2·09 | ,, | Loch Shiel, Glenfinnan. | 6·22 |
| ,, | Calne, Compton Bassett | 1·71 | ,, | Dalwhinnie H.R.S..... | ... |
| ,, | Beaminster Vicarage ... | 1·09 | XIX. | Lairg H.R.S. ..... | 2·95 |
| ,, | Dartmoor, Princetown.. | ... | ,, | Altnabreac H.R.S. ..... | 2·96 |
| ,, | Langtree Wick ..... | ... | ,, | Watten H.R.S. ..... | 1·99 |
| ,, | Lynmouth, Glenthorne. | 2·27 | XX. | Fermoy, Glenville ..... | 4·30 |
| ,, | St. Austell, Cosgarne... | 2·54 | ,, | Tralee, Castlemorris ... | 4·12 |
| ,, | Taunton ..... | 1·53 | ,, | Cahir, Tubrid ..... | 2·56 |
| VI. | Bristol, Ashleydown ... | ... | ,, | Tipperary, Henry St.... | 2·01 |
| ,, | Ross ..... | 3·23 | ,, | Newcastle West ..... | 3·04 |
| ,, | Wem, Sansaw Hall..... | 4·17 | ,, | Kilrush ..... | 3·94 |
| ,, | Cheadle, The Heath Ho. | 2·67 | ,, | Corofin ..... | 4·14 |
| ,, | Bickenhill Vicarage ... | 3·51 | XXI. | Kilkenny, Butler House | 1·77 |
| VII. | Melton Mowbray ..... | 3·30 | ,, | Carlow, Browne's Hill.. | 2·15 |
| ,, | Horncastle, Bucknall... | 3·65 | ,, | Kilsallaghan..... | 2·63 |
| VIII. | Walton-on-the-Hill..... | 2·99 | ,, | Navan, Balrath ..... | 2·23 |
| ,, | Broughton-in-Furness .. | 3·61 | ,, | Athlone, Twyford ..... | 6·09 |
| IX. | Wakefield, Stanley Vic. | 2·46 | ,, | Mullingar, Belvedere... | 3·47 |
| ,, | Ripon, Mickley ..... | 1·83 | XXII. | Ballinasloe ..... | 3·85 |
| ,, | Scarborough..... | 2·43 | ,, | Clifden, Kylemore ..... | 7·84 |
| X. | Mickleton..... | 2·40 | ,, | Crossmolina, Enniscoe.. | 3·24 |
| ,, | Haltwhistle, Unthank.. | 3·59 | ,, | Carrick-on-Shannon ... | 2·88 |
| ,, | Shap, Copy Hill ..... | 2·85 | XXIII. | Dowra ..... | 5·13 |
| XI. | Llanfrechfa Grange ..... | 2·83 | ,, | Rockcorry..... | 2·57 |
| ,, | Llandovery ..... | 3·23 | ,, | Warrenpoint ..... | 2·93 |
| ,, | Solva ..... | 1·08 | ,, | Newtownards ..... | 1·41 |
| ,, | Castle Malgwyn ..... | 3·71 | ,, | Carnlough..... | 1·63 |
| ,, | Rhayader, Nantgwillt.. | 4·65 | ,, | Bushmills ..... ..... | 3·19 |
| ,, | Carno, Tybritle ..... | 3·88 | ,, | Buncrana ..... | 3·66 |

# JUNE, 1880.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1860–5 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date. | Min. Deg. | Date. | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | Camden Square | 4·04 | + ·99 | 1·13 | 25 | 17 | 79·8 | 30 | 38·3 | 5 | 0 | 0 |
| II. | | Maidstone (Hunton Court) | 2·30 | — ·42 | ·41 | 17 | 19 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss | 2·61 | ... | ·32 | 22 | 19 | 75·5 | 29 | 36·0 | 5 | 0 | 1 |
| III. | | Hitchen | 2·45 | — ·19 | ·42 | 24 | 19 | 72·0 | 28† | 36·0 | 4 | 0 | 0 |
| ,, | | Banbury | 2·75 | — ·53 | ·63 | 22 | 19 | 75·6 | 29 | 35·0 | 9 | 0 | 0 |
| IV. | | Bury St. Edmunds (Culford) | 2·52 | — ·06 | ·58 | 15 | 17 | 78·0 | 29 | 32·0 | 4 | 1 | 1 |
| ,, | | Norwich (Cossey) | 3·58 | + 1·36 | ·63 | 23 | 19 | 77·5 | 22 | 40·0 | 5 | 0 | 0 |
| V. | | Bridport | 1·32 | — 1·92 | ·28 | 13 | 15 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple | 1·71 | — 2·41 | ·53 | 18 | 12 | 73·0 | 19 | 40·0 | 10‡ | 0 | ... |
| ,, | | Bodmin | 2·05 | — 1·99 | ·58 | 20 | 17 | 71·0 | 29 | 42·0 | 12 | 0 | 0 |
| VI. | | Cirencester | 1·90 | — 1·48 | ·34 | 30 | 12 | ... | ... | ... | ... | ... | ... |
| ,, | | Shifnal (Haughton Hall) | 3·86 | + ·75 | ·55 | 24 | 23 | 72·0 | 29 | 35·0 | 9 | 0 | 0 |
| ,, | | Tenbury (Orleton) | 4·17 | + ·65 | 1·03 | 17 | 19 | 74·3 | 29 | 34·8 | 10 | 0 | 1 |
| VII. | | Leicester (Town Museum) | 3·80 | ... | ·87 | 22 | 22 | 73·0 | 29 | 38·0 | 5 | 0 | 5 |
| ,, | | Boston | 3·95 | + 1·76 | ·91 | 19 | 16 | 80·0 | 29 | 37·0 | 5 | 0 | 0 |
| ,, | | Grimsby (Killingholme) | 1·61 | ... | ·34 | 23 | 15 | 74·0 | 29 | 40·0 | 5, 9 | 0 | ... |
| ,, | | Mansfield | 4·30 | ... | ·81 | 22 | 20 | 74·9 | 29 | 37·3 | 5 | 0 | 0 |
| VIII. | | Manchester (Ardwick) | 2·34 | — ·74 | ·38 | 7,10 | 20 | 75·0 | 18‖ | 41·0 | 5 | 0 | 0 |
| IX. | | York | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) | 6·80 | + 2·70 | 1·67 | 27 | 25 | 73·0 | 22 | 33·0 | 8 | 0 | ... |
| X. | | North Shields | 1·24 | — 1·50 | ·37 | 15 | 13 | 67·3 | 29 | 39·0 | 9,10 | 0 | 0 |
| ,, | | Borrowdale (Seathwaite) | 9·68 | — ·83 | 2·82 | 27 | 21 | ... | ... | ... | ... | ... | ... |
| XI. | WALES. | Cardiff | 2·38 | ... | ·53 | 17 | 19 | 72·1 | 18 | 41·2 | 10 | 0 | 0 |
| ,, | | Haverfordwest | 2·33 | — 1·32 | ·31 | 19 | 16 | 74·0 | 17 | 34·5 | 9 | 0 | 3 |
| ,, | | Aberdovey | 3·84 | ... | ·60 | 19 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno | 2·59 | + ·30 | ·49 | 19 | 16 | 69·4 | 22 | 41·0 | 10 | 0 | ... |
| XII. | | Cargen | 2·12 | — 1·32 | ·78 | 29 | 13 | 76·6 | 18 | 35·6 | 9 | 0 | 1 |
| ,, | | Hawick (Silverbut Hall) | 1·29 | ... | ·32 | 30 | 12 | ... | ... | ... | ... | ... | ... |
| XIV. | | Douglas Castle (Newmains) | 1·87 | ... | ·53 | 29 | 15 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Long (Arddaroch) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Kilmory | 3·17 | ... | ·62 | 27 | 15 | ... | ... | 33·0 | 11 | 0 | ... |
| ,, | | Mull (Quinish) | 3·42 | ... | ·99 | 12 | 15 | ... | ... | ... | ... | ... | ... |
| ,, | | Loch Leven | 1·60 | — 1·25 | ·30 | 28* | 9 | ... | ... | ... | ... | ... | ... |
| XVII. | SCOTLAND. | Arbroath | 1·53 | — 1·00 | ·68 | 29 | 14 | 76·0 | 29 | 40·0 | 9 | 0 | ... |
| ,, | | Braemar | 3·07 | — ·37 | ·90 | 29 | 18 | 71·0 | 24 | 33·3 | 11 | 0 | 0 |
| XVIII | | Aberdeen | 2·94 | ... | ·77 | 29 | 17 | 73·0 | 29 | 40·0 | 7 | 0 | 0 |
| ,, | | Portree | 3·25 | — 1·53 | ·87 | 28 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | | Inverness (Culloden) | 1·00 | — ·92 | ·27 | 30 | 8 | 69·8 | 25 | 35·2 | 9 | 0 | 4 |
| XIX. | | Dunrobin | 2·77 | + 1·20 | ·92 | 30 | 13 | 65·0 | 28 | 39·0 | 8 | 0 | ... |
| ,, | | Sandwick | 2·30 | + ·76 | ·59 | 30 | 15 | 66·0 | 17 | 40·8 | 5 | 0 | 2 |
| XX. | | Cork | 2·10 | ... | ·94 | 12 | 15 | 82·0 | 24 | 36·0 | 9 | 0 | ... |
| ,, | | Darrynane Abbey | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Waterford | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Killaloe | 4·82 | + 1·19 | ·88 | 20 | 18 | 80·0 | 24 | 35·0 | 9,10 | 0 | ... |
| XXI. | IRELAND. | Portarlington | 2·31 | — ·94 | ·32 | 24 | 16 | 72·5 | 18 | 35·0 | 9 | 0 | ... |
| ,, | | Monkstown | 3·70 | + 1·09 | 1·26 | 22 | 16 | ... | ... | ... | ... | ... | ... |
| XXII. | | Galway | 5·67 | ... | 1·27 | 12 | 19 | 75·0 | 19 | 38·0 | 9 | 0 | ... |
| XXIII | | Waringstown | 3·31 | ... | ·67 | 23 | 16 | 78·0 | 17 | 34·0 | 8 | 0 | 0 |
| ,, | | Londonderry | 2·91 | ... | ·71 | 29 | 15 | 73·0 | 21 | 38·5 | 10 | 0 | 2 |
| ,, | | Edenfel (Omagh) | 3·37 | ... | ·63 | 20 | 22 | 76·0 | 18 | 29·0 | 9 | 2 | ... |

* And 30. † And 29. ‡ And 11. ‖ And 29.

+ Shows that the fall was above the average; — that it was below it.

# METEOROLOGICAL NOTES ON JUNE.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—The gentle rains and high temps. during the month greatly improved the crops. Haymaking commenced on 21st; wheat rather rank and uneven in places; potatoes so far good. Dog rose in flower on 1st, elder on 8th, purple foxglove on 12th, and wild thyme on 30th. Meadow brown butterfly seen on 13th, and clouded yellow butterfly on 21st.

HITCHEN.—An unsettled month, temp. below the average.

BANBURY.—TSS on 17th, 22nd, 23rd, 24th, and 25th. High wind on 5th and 7th. Wheat in bloom at end of month.

CULFORD.—Mean temp. of month 58°·0. Polar winds prevailed on 13 days. High wind on 7th and 9th, T on 7th, 8th, 19th, 22nd, 23rd, and 24th.

COSSEY.—TSS on 7th, 8th, and 23rd.

BODMIN.—A most genial month, mean temp. 59°·1.

CIRENCESTER.—A dry cool month generally, with a few welcome thundershowers towards the end. Wind variable.

SHIFNAL.—R daily with three exceptions till the 26th. No "hot band" here as predicted by Mr. Brumham *(Met. Mag.*, vol. xv., p. 56*)*. Min. ther. down to 35° on the 9th, and the max. never reaching 70° till the 17th, from that date to the close fine growing weather with T either near or distant almost daily. First strawberries gathered on 21st, first peas on 22nd. Mangold wurzel quite destroyed by a grub, the same that ruined them in 1861. Turnips, &c., not touched by them.

ORLETON.—The first half of the month was cold and damp with frequent R and rough winds, the remainder was warmer with less wind, but with frequent storms of L and T and heavy falls of R. Mean temp. rather more than 1°·5 below the average. T was heard on 10 days, and the storms were heavy on the 17th, 19th, 24th and 25th, causing floods in the brooks.

BOSTON.—The mean temp. of the month was 2°·4 below the average. A very heavy TS occurred on the 19th, when ·89 in. of R fell in 45 minutes. In addition to very heavy T, a H storm broke over a part of this district, commencing in its full intensity just S. of Boston and travelling about 15 miles in a S.E. direction it terminated in the Wash. The H stones are described variously as being from the shape and size of a walnut to jagged pieces of ice two and three inches in length. Very great damage was done to the crops in the limited space over which it passed, the vegetation being cut off level with the ground. A very great number of chickens, ducklings, and even sea birds were killed, and many hundred panes of glass broken in the churches and houses. Wheat came into ear about the 27th; all the crops in this district look remarkably well.

GRIMSBY.—N. and N.E. winds prevailed with little intermission till the 26th, and from that date to the close of the month the weather was warm; T on 8 days. Pastures very good and corn and green crops very promising.

NORTH SHIELDS.—T on 5 days, H on 3 days.

## WALES.

HAVERFORDWEST.—Cold ungenial weather prevailed up to the 11th; from the 11th to the 20th R fell in considerable quantities, principally at night; the days generally were fine and warm with plenty of sunshine; the weather from the 20th to the end was fine, sunshiny, warm, and sometimes close, but altogether everything that could be desired, and the hay crops are very good. On the 8th a heavy storm of H and sleet occurred, making the ground and hedges quite white; in exposed situations and on high land it did not melt for some hours. A severe storm occurred on the 18th; distant T had been heard all day, but it was not till about 8 p.m. that it became near; the L was forked and very vivid, but there was scarcely any R. At Milford a horse was killed by the L, and an iron boiler at Milford Docks was shattered. The storm was at its

height about 2 a.m. on the 19th. The four days from 9th to 12th inclusive were remarkably cold, the max. temp. of the period being 63°, and the min. 34°·5.

LLANDUDNO.—Weather variable and showery, but most favourable for the growth of grass, grain, and potatoes, which all look uncommonly well. Temp. rather below the average. T on five days.

SCOTLAND.

CARGEN.—Mean temp. of month 57°·7, nearly 1° above the average; amount of sunshine also above the average. T on 5 days; heavy hail shower for 20 minutes on 8th, yielding ·48 in. of water.

HAWICK.—The weather during the month was dry, and E. winds prevailed. The hay crop was light, and pastures at the end of the month were almost burnt up. Potatoes look well. Great scarcity of small birds.

DOUGLAS CASTLE.—TSS on 8th, 22nd, 23rd, and 24th, and T on 21st.

BRAEMAR.—Very severe TS from noon to 4 p.m. on 22nd; the L very vivid and doing some damage to trees. T on 9th, 10th, 23rd, and 25th.

ABERDEEN.—At the beginning of the month the winds were northerly, at times attaining considerable strength; the greatest force occurred on the 4th, when a velocity of (approximately) 48 miles an hour was reached. During the latter half of the month the winds were light and variable.

PORTREE.—A dry month; bright sun during the day, and sharp air during the night. Cattle and sheep in good condition, and thriving well on the hill pastures.

CULLODEN.—Rainfall of the month small with little heat. Hay crop less than average; turnips advancing notwithstanding want of moisture.

SANDWICK.—The temperature was rather below the mean, but, never being higher than 66°, nor lower than 40°·8, and little rain, it formed as agreeable a climate as could be found perhaps in any part of Britain. There was a sun pillar for about an hour at sunset on the 24th, but the nights were far too light to allow any aurora to be seen.

IRELAND.

KILLALOE.—Abundance of R and high temp., with generally calm weather, have been the features of the weather; rapid vegetation has been the natural result, and pastures, meadows, corn, and green crops are very forward and promising.

MONKSTOWN.—A very seasonable and warm month, heavy showers alternating with bright hot sunshine; the showers were remarkably partial; T and L frequent.

WARINGSTOWN.—A very fine warm and genial month; crops flourishing. Such a luxuriant potatoe crop has not been known since 1846.

LONDONDERRY.—Wind variable, temp. higher than usual all through; month generally very mild. Growth of vegetation very rapid.

## RAPID BAROMETRIC CHANGES.

*To the Editor of the Meteorological Magazine.*

SIR,—On page 67 of last month's magazine, in your report of the rapid rise from Rochefort of 0·41 in. in 1 hour and 30 minutes, I have herewith appended a rapid change which took place under my personal observation on the 12th March, 1876:—

| | Barometer. | | Barometer. |
|---|---|---|---|
| At 8 a.m. | 28·30 | At 5 p.m. | 28·45 |
| ,, 10 ,, | 28·25 | ,, 6 ,, | 28·55 |
| ,, 0 p.m. | 28·16 | ,, 7 ,, | 28·64 |
| ,, 2 ,, | 28·03 | ,, 8 ,, | 28·73 |
| ,, 3·30 ,, | 28·00 | ,, 9 ,, | 28·83 |
| ,, 4 ,, | 28·25 | | |

It will be seen that the rate of the rise was 0·30 in. per hour.—Yours truly,

CHARLES WOOLETT, F.M.S.

*Acrise, July 5th,* 1880.

# SYMONS'S

## MONTHLY

# METEOROLOGICAL MAGAZINE.

CLXXV.] AUGUST, 1880. [PRICE FOURPENCE. *or 5s. per ann. post free.*


## "HIGH LEVEL" METEOROLOGICAL STATIONS.

WE may as well begin this note with a few definitions, because they may be useful to one or two readers, and cannot do harm to any one:—

A **First Order Meteorological Station** is one where all the principal meteorological elements—pressure, temperature, direction and velocity of wind, humidity, and rainfall, are continuously recorded by self-recording instruments.

A **Second Order Station** is one provided with a full set of standard verified instruments, which are observed *at least* twice a day, viz., at 9 a.m. and 9 p.m.

A **Climatological Station** must have the following standard verified instruments—Dry and wet bulb thermometer, also maximum and minimum thermometers, all placed in a Stevenson's screen, and also a rain gauge, all which instruments are read at 9 a.m. daily.

A **Rain Gauge Station** is, of course, a station supplied with a rain gauge, but not with the other instruments needful for qualifying it to pass into the higher classes.

Our readers may recollect that Mr. Stow and others have, from time to time, urged the importance for the purposes of accurate daily weather forecasting, of obtaining telegraphic records from stations at considerable altitudes. At present, high level *rain gauge stations* are somewhat numerous. In *British Rainfall*, 1879, we find perfect returns from fifty-three stations, all more than a thousand feet above the level of the sea, and the following twelve are 1,500 feet or more :—

| | | |
|---|---|---|
| Derby | Buxton (Axe Edge) | 1620 feet. |
| ,, | Comb's Moss | 1669 ,, |
| Yorkshire | Skipton (Thorpe Fell) | 1661 ,, |
| ,, | Langstrothdale (Cam Fell) | 2000 ,, |
| ,, | Lune Head [Brough] | 1779 ,, |
| Northumberland | Cheviot (Broadstruther) | 1692 ,, |
| Cumberland | Sprinkling Tarn | 1985 ,, |

| | | |
|---|---|---|
| Westmoreland ..... | Kirkstone Pass ..... | 1500 feet. |
| ,, ..... | Hurth Syke [Alston] ..... | 2000 ,, |
| Perthshire ..... | Ledard..... ..... | 1500 ,, |
| ,, ..... | Glen Finlas..... ..... | 1800 ,, |
| Forfar..... | Kirriemuir (Creich Hill) ..... | 1500 feet. |

Owing to the great difficulty which arises in the measurement of snow, very many of the records from the loftiest stations were absent last year, and therefore as regards *Rainfall Stations* we think that the numbers at present at work are about as follows:—1,000 ft. or more, 60; 1,500 ft. or more, 20; 2,000 ft. or more, 5; 3,000 ft. or more, 1.

We now turn to *Climatological Stations*, and their approximate equivalent, *Telegraphic Reporting Stations.*

In Devonshire there is a complete Second Order Station, maintained at the cost of the Meteorological Society, at Prince Town, Dartmoor, 1,389 ft. above the sea. As the most cordial relations prevail between the Meteorological Society and the Meteorological Council, the latter being the body under whose authority the daily weather reports are issued, we cannot understand why the records from this station are not inserted in the daily weather reports, especially as the telegraph office is close to the instruments. It cannot be that the Meteorological Council do not care for high level records, for we shall presently show that they have gone to the expense of establishing a paid station in another district.

Proceeding northwards, we come next to the new station, the establishment of which suggested this article. There is a large tract of somewhat high land in the north-east of Staffordshire, joining, in fact, that of West Derbyshire. It is not so well provided even with rain gauge stations as is desirable, but we have for several years received records from :—

| | | |
|---|---|---|
| Cheadle (Tean Vicarage) ..... | altitude | 470 feet. |
| * ,, (The Heath House)..... | ,, | 647 ,, |
| Alstonfield ..... | ,, | 910 ,, |
| Leek ..... | ,, | 538 ,, |

* Complete *Second Order Station.*

A year or so since, Mr. Clement L. Wragge established a *Climatological Station* at Farley, four miles East of Cheadle, and 643 ft. above sea. Then he induced the station master at Oakamoor, one mile West of Farley, and 293 ft. below it, to take charge of the necessary instruments, and to make the observations necessary to constitute that a second *Climatological Station*, and recently he has started a third *Climatological Station* on the summit of Beacon Stoop, the highest point of the Weaver Hills, two miles N.E. of Farley, and 1,205 ft. above sea level. There is no dwelling near this station, and Mr. Wragge or his assistant has, therefore, a daily walk of four miles in order to make the observations, and much as we may admire the zeal which has promoted the establishment of the station, and the undertaking of the daily task, we think that even Mr. Wragge will

have to give it up when the hills are buried, as they often are, in a thick coat of snow.

North again of this group come the high Derbyshire stations, and here, as at Dartmoor, we have a complete *Second Order* station of the Meteorological Society, close to a telegraph office, and therefore available for weather telegraphy—we refer to Buxton, 987 ft. above sea.

In the West Riding of Yorkshire there are many *Rain Gauge* stations, at elevations exceeding 1,000 ft., and Mr. Binnie, C.E., has, we believe, the necessary instruments for furnishing *Climatological* returns from one or more stations on the gathering grounds of the Bradford Water Works, but we have not yet seen the observations in print, and they are not sent to the Meteorological Society. In the North Riding of Yorkshire the Meteorological Council have established their (only) high level station, virtually a *Second Order* one, at Hawes Junction, 1135 ft. above sea.

In Northumberland a full *Second Order* station used to exist at Allenheads (1353 ft.), but, although the record of the fall of rain is continued, we have not recently seen any details of temperature or other meteorological elements. This is a pity, for this station is like most of those we have mentioned, close to a telegraph office.

In Cumberland and Westmoreland there are *rain gauges* at various heights up to 3200 ft., but there are no regular climatological stations at any considerable height.

Finally, we may sum up the whole in the following table :—

| County. | Station. | Equipment. | Altitude. |
|---|---|---|---|
| Devonshire ..... | Dartmoor..... | Second Order... | 1389 feet. |
| Stafford ..... | Beacon Stoop ..... | Climatological.. | 1205 ,, |
| Derbyshire ..... | Buxton..... | Second Order... | 987 ,, |
| Yorkshire..... | Hawes ..... | ,, ,, ... | 1135 ,, |
| Northumberland... | Allenheads ..... | ,, ,, ... | 1353* ,, |
| | and in Scotland— | | |
| Dumfries ..... | Wanlockhead ..... | Second Order... | 1334 ,, |
| Peebles..... | North Esk Reservoir... | ,, ,, ... | 1150 ,, |
| Perth ..... | Dalnaspidal..... | ,, ,, ... | 1500 ,, |
| Aberdeen..... | Braemar ..... | ,, ,, ... | 1114 ,, |
| ,, ..... | Tillypronie ..... | ,, ,, ... | 1120 ,, |

* Perhaps discontinued.

## REVIEW.

*Aus dem Archiv der Deutschen Seewarte.* I. JAHRGANG, 1878. Herausgegeben von der Direktion der Seewarte. 4to. Hamburg, 1878. [1880.]

THIS is so excellent a volume that we are sorry to begin with a complaint, but it is too bad to put the imprint of 1878 at the foot of the title-page of a book printed in 1880. English publishers, in order that books may look new, date all those published late in the autumn of one year as if they had appeared in the next year; for instance, a book published in November, 1880, will be dated 1881.

This will prove sufficiently puzzling to future bibliographers, but Dr. Neumayer has gone the other way, and while he correctly puts 1878 in the body of the title, quite incorrectly puts the same date at the bottom of the page as that of publication. That there is not a shadow of doubt as to the wrongness of these figures is proved by the Introduction being dated February, 1880.

Being the first volume of the quarto publication of the German Naval Observatory, much space is naturally devoted to a description of the organization of the department, of the premises, and of the instruments. The details of the organization and of the staff possess only national, not international, interest, except as regards Englishmen and Australians, who will be glad to find at the head of the establishment Dr. Neumayer, who was for many years director of the Flagstaff Observatory, Melbourne, and while there published much valuable information. The equipment of apparatus at the chief Observatory at Hamburg is, however, of general interest, and we therefore epitomize it.

ANEMOMETER. — The Casella-Beckley or Meteorological Office pattern.

SOLAR RADIATION.—Bright and blackened bulb thermometers *in vacuo*, erected on the roof.

RAIN GAUGES.—Two, of which the construction is not stated—one in the garden near the compass-testing house, the other on the roof of the Naval Observatory.

THERMOMETERS.—There are duplicates; the majority are placed opposite north windows on the first floor (but for the sake of comparison a thermometer stand has been erected in the garden); outside these windows are a psychrometer (*i.e.*, a dry and wet bulb thermometer), several hygrometers, and two recording thermometers, one a metallic one on Hipp's plan, and one on Schreiber's. There is also a "Vakuometer" for testing marine barometers, and we should be glad to know whether any reason exists for the same term (spelled, however, with a c, "Vacuometer") not being applied to these arrangements wherever erected.

BAROMETERS.—The standard barometer is of the pattern known upon the Continent as the "Cistern-syphon-barometer," and known in England as the Russian barometer. There are also two recording barographs, one upon Schreiber's system, and the other a recording aneroid by Hipp.

The next section of the work describes the subsidiary establishments, which are under the control of the chief observatory. These are (1), chief agencies at Bremerhaven, Swinemünde, and Neufahrwasser, for the verification of nautical and meteorological instruments and for the instruction of naval officers; (2), secondary agencies at Memel, Lübeck, Rostock, and eleven minor ports; (3), nine first order meteorological stations, and a considerable number of secondary and telegraphic stations.

Under the head of "Library and Collection of Maps," Dr. Neumayer is in the happy position of being able to announce the purchase, for £1500, of the splendid library of Professor Dove. Its real value will be ascertained only when the catalogue appears, but there can be no doubt that it is nearly, if not absolutely, the best meteorological library in the world. The total number of volumes (or rather of *Bände*, which is perhaps rather a smaller number of sheets than an Englishman would call a volume) was about 8,000, of which about 2,500 are described as purely meteorological. We need not say that we are very anxious to see the catalogue. One very excellent feature in Dr. Neumayer's arrangement is that this grand collection is open to the public from 9 to 3 daily, excepting Sundays and fête days.

Another good feature is the holding of evening meetings, presided over by the director, at which the publications received from foreign countries since the last meeting are discussed, so that the whole staff of the observatory may be acquainted with what is being done.

We are glad to find in this volume that which, we presume, is a reprint of the *Instruktion für den Meteorologischen Dienst der Deutschen Seewarte;* it occupies 60 quarto pages, and detailed notice of it cannot therefore be given upon the present occasion.

## AURORA BOREALIS.

Professor Sophus Tromholt, of Bergen, has been organising a system for observing the aurora borealis in Norway, Sweden, and Denmark, and he desires to extend it to Iceland and to Great Britain. There are reasons for believing that we are approaching a period of maximum auroral coruscations, and Professor Tromholt is desirous of enlisting observers on the same system as he has introduced into Scandinavia. The necessary instructions will be sent to anyone applying to him at Bergen before the end of August.—*Public Opinion*, July 17th, 1880.

## THE MINIMUM OF —23° AT BLACKADDER.

### FURTHER CONFIRMATORY EVIDENCE.

"In a communication we have received from Tweedside in the district where the extremely low temperature of 17° below zero was recorded last winter, our correspondent writes—'I have not an apple or pear on my ninety trees in the orchard, and on the walls only one, two, or three. Many of the old apple and pear trees have died in the orchard here; and close to Swinton House I saw rows of old oaks probably one hundred years old without any appearance of vegetation. It has been a dreadful winter, but at Hope Park, with the exception of one peach tree and one apple tree, I have escaped with a little scorching. There is no fruit anywhere.'"—*Journal of Horticulture*, July 1st, 1880.

## A THUNDERBOLT (!).

[The following paragraphs have appeared in the *West Middlesex Advertiser*, but, as though written in a very popular style, they may possibly amuse some of our readers, and may instruct others, we, therefore, reprint them *verbatim*.—ED.]

"FALL OF A THUNDERBOLT.

"During the storm which burst so suddenly in many parts of London on Saturday last, the 26th June, what is commonly called a thunderbolt fell in Chelsea. Mercifully no one was injured, though a portion of a chimney stack was shattered. As the circumstances in this case throw light on the origin of "thunderbolts" or "ærolites," it may be interesting to our readers to give them in detail. About 3 p.m., in the midst of many peals of thunder, one clap was heard which sounded far louder and sharper than the others, and gave one the idea of a conservatory being shatterred. At this time, what appeared like a ball of fire fell on the chimney stack of 180, Oakley-street. The servants sitting in the kitchen were suddenly alarmed by the room being filled with smoke and a heavy black mass falling down the chimney into the grate, where it appeared to break and scatter fragments over the room. They naturally rushed from the room, but as soon as they recovered from their fright, and the smoke had somewhat dispersed, they returned to the kitchen to ascertain what had really happened. Among the *débris* in the grate a piece, apparently of a ball about 8 or 9 inches in diameter was found, like a cinder with here and there fragments of metal in it. In getting it out of the grate it was unfortunately broken, being very brittle, and with the other contents of the grate was thrown out in the back garden. Curiosity, however, soon dispersed the fragments in many directions, so that a practical investigation as to the weight, &c., was rendered impossible. One piece, the largest we saw, about 3 in. by 2 in., which is now in the possession of Miss Eleanor Davies, goes far to support the theory that ærolites do not drop from the clouds, but are the result of the fuzing together by the lightning of the matter where it first strikes the earth. This piece has all the appearance of having been exposed to great heat, but in its midst is distinctly visible a small piece of red brick. The lightning passed into the earth, and it is a source of thankfulness that no one in either this or the adjacent house was in any way affected by it."—*West Middlesex Advertiser*, July 3rd.

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"FALL OF A THUNDERBOLT.

"[We have made further investigation into the facts connected with the electrical discharge recorded in our last; and it appears that what is described as a 'ball of fire' was seen to fall on the house No. 180, Oakley-street. The servants who were in the kitchen at the time, being much alarmed at a quantity of smoke and soot coming down the chimney, ran out of the room, and on their return found, firmly wedged in the grate, a ball, about 7 or 8 in. in diameter; they attempted in vain to get it out, and broke it with a poker; it was very hard, and was composed of particles of mortar, brick, soot, cinder, &c. We submitted the most perfect fragment we could find to G. J. Symons, Esq., F.R.S., the president of the Meteorological Society, and he has favoured us with the following interesting letter.—ED. *W. M. A.*]

"*To the Editor of the West Middlesex Advertiser.*

"SIR,—As I am indebted to your courtesy both for the account of the above given in the *West Middlesex Advertiser* of July 3rd, and also for an examination of portions of the matter found in the grate, it is only fair that the conclusions to which I have been led should first be offered for insertion in your columns.

"With your original account I have only one fault to find. You, like nineteen persons out of twenty, or ninety-nine persons out of every hundred, do not put clearly the difference between thunderbolts (which do not exist) and ærolites (which do).

"An ærolite (Αερ air, λιθος a stone) is a shooting star, is in fact an infinitely small world, a mass of stone or of metal, whirling through space at an enormous velocity, and which, coming near to the earth, is, by the attraction of that body, compelled to fall upon it. These may be of any size from a few inches across to many feet. There are some large ones, and fragments of many others in the British Museum; but their fall has obviously no connection with thunderstorms.

"Thunderbolts, I have already said, do not exist. I have been trying to find one for a quarter of a century, and have always failed. The following paragraph from the *Meteorological Magazine* for August, 1866, may amuse your readers, and also show how carefully one must scrutinise every report.

"'THE TRUE HISTORY OF A THUNDERBOLT.

"'On July 2nd one of the London papers startled some of its readers by inserting a letter on the thunderstorm of June 30th, in which the writer said, 'At six o'clock it broke out again with increased violence, the rain descending in torrents, and at a few minutes past seven a thunderbolt fell in the gutter opposite my house (in Westbourne Park, Notting Hill,) and was smashed to pieces, one of which I have. At the hour at which I write, numbers of persons are still searching for the fragments.'

"'Feeling certain that there was a week point somewhere, inasmuch as "thunderbolts" have no existence, we called on the writer and other residents, found the story amply confirmed, received several pieces of the "thunderbolt" (by the bye, some were sold at 10/- and 15/- each), and eventually ascertained that one of the pupils of an analytical chemist had availed himself of his tutor's absence to fill a capsule with materials calculated to burn vigorously, and explode in heavy rain, and, during the height of the storm, had thrown the burning mass into the gutter, so making an artificial thunderbolt. It is no wonder that the neighbours were taken in by a trick so well arranged.'"

"You have, I believe, hit off precisely the origin of the idea, which is very widely held, of the fall of a solid bolt when you say that the fragment in the possession of Miss Davies 'goes far to support the theory that ærolites (should be thunderbolts) do not drop from the clouds, but are the result of the fusing together by the lightning of the matter where it first strikes the earth.'

"Lightning, which is like a momentary electric light, is intensely heating, and in the British Museum will be found several fulgurites, which are portions of sand which, by the heat of lightning, have been vitrified or fused into a glass-like substance. When lightning falls on a bed of sand, like, for instance, that between Boulogne and Abbeville, it has to penetrate to a considerable depth before it reaches the underground water stratum, and all along its course it vitrifies the sand. Hence fulgurites may sometimes be found as much as thirty feet long.

"The Oakley-street occurrence is, to the best of my knowledge, unprecedented. Dozens of chimneys (especially kitchen chimneys, because in summer it is usually only from them that heated air is escaping) are struck every year, and generally the contents of the grate are scattered over the room amid a blaze of light. But in your account there is no indication of either light or noise being markedly present in the kitchen, nor of the sulphurous smell which almost always accompanies a discharge of lightning. It is very unfortunate that more of the fragments have not been recovered, but those which I have seen lead me to think that the lightning cleared the chimney of soot and of some fragments of brick and mortar, and on reaching the grate fused into a single lump the sweeping from the chimney and the fragments of coal which were in the grate. The principal fragment contains brick and coal, some of the latter burnt, some unburnt. Obviously this coal could not have been at the top of the chimney, and hence it is that I hold that the agglomeration occurrred not at the top of the chimney but in the grate.

"Nothing fell from the sky; but the lightning, instead of scattering the contents of the chimney and of the grate, fused much of them into a single lump.

"Your obedient servant,

"62, Camden-square, N.W." "G. J. SYMONS.

## WATERSPOUT IN GLAMORGANSHIRE.

"The extraordinary atmospheric disturbances which have caused such destructive floods in South Wales seem to have culminated on Thursday week [July 22nd]. On the afternoon of that day a waterspout passed over Gower [the name of the South-west of Glamorganshire.] The waterspout was distinctly seen by a large number of people. The day had been sultry, though about one o'clock there was a heavy fall of rain for upwards of an hour. This shower, like most of those that have lately been experienced, was quite local, no rain at all having fallen at Swansea at the time. After the shower the sun shone brightly till four o'clock, when the thunder clouds were seen to be again gathering. The spout was first noticed about half-past four, at which time it was fully developed. It appeared to be about four miles off, in the neighbourhood of Penclawdd, and to be moving eastward. It consisted of a long slender column of dense vapour or rain descending from the clouds to the earth, and tapering gently towards the lower end, which was hidden from view by the rising ground at the head of the valley. The outlines were perfectly sharp, and clearly defined. It continued in this condition about five minutes, and then the lower portion gradually faded away, the upper part becoming at the same time more ragged. Ultimately what remained was absorbed in the heavy black clouds from which it originated, and these passing eastwards discharged for about an hour a perfect deluge of rain over Clyne Valley. The waterspout was observed from the vessels which entered the port of Swansea. It is described as originating near Oxwich Bay. A column of water was whirled up from the sea to meet a corresponding column descending from the clouds. The waterspout must afterwards have been carried completely across the peninsula of Gower to the spot where it was seen to dissolve."—*Hereford Times*, July 31st.

[There is no rain gauge in the district above mentioned, hence the above is probably the only record of the phenomenon. Waterspouts very rarely pass over rain gauges. Out of three reported in 1879—viz., those on April 26th, near Wolsingham, Durham; June 12th, Kilrea, Londonderry; and August 30th, Drum Park Hill, Dumfries—the last is the only one of which even a partial record was obtained. It gave at the station at Drum Park four inches of rain between 2 and 6 p.m.—ED.]

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## WATERSPOUT IN HERTFORDSHIRE. (?)

*To the Editor of the Meteorological Magazine.*

SIR,—I am afraid you have no observer in the vicinity of Hoddesdon; but last Wednesday there appears to have fallen something like a waterspout over the Wormley Woods, causing the water in Miss Warner's grounds at Hoddesdon to rise 10 feet. People who saw the clouds, describe the storm as taking a conical form, and, to use their expression, the top of the cone suddenly fell in. There were

also enormous hailstones in the neighbourhood ; and a tree was struck with lightning, whilst the sun was shining, on the cricket-field at Essendon—altogether it seems to have been an eccentric sort of day. I should imagine it threw the storms of August last year and July the year before quite into the shade.—Yours truly,

W. LUCAS.

*Hitchen, 20th July,* 1880.

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## RAINFALL PERIODICITY.

*To the Editor of the Meteorological Magazine.*

SIR,—I cannot help wishing that you would call attention to the frequent recurrence of very heavy falls of rain *about* the 24th–26th of the month, especially in the later months of the year. I called Mr. Dines' attention to this some years ago, and he agreed with me that the phenomenon certainly did exist.

In a long series of years (say 50), on the mere doctrine of chances, heavy rainfalls should be dotted about the various days of the months so as to be nearly equally distributed, at least, in each of the three decades. But the longer the series you examine, the more you find that they tend to cluster round certain periods, as *nuclei* (so to speak).

My health and want of leisure preclude my attacking this problem fully. I wish you would ask for observations. If anything like positive monthly periodicities can be scientifically established, a real step onwards would be gained.

Some figures which I worked out from 40 years, given me by Mr. Dines, show that heavy rains *are pretty equally* distributed through the year, except in the following cases :—

| | | | | | | |
|---|---|---|---|---|---|---|
| January 12 ..... | Expectancy | 5 | times | greater | than | average. |
| May 6, 7, 8..... .. | ,, | 2½ | ,, | ,, | ,, | ,, |
| June 12 ..... ..... | ,, | 3 | ,, | ,, | ,, | ,, |
| July 18 ..... .. | ,, | 2 | ,, | ,, | ,, | ,, |
| ,, 23 ..... | ,, | 3 | ,, | ,, | ,, | ,, |
| ,, 26, 27..... | ,, | 2 | ,, | ,, | ,, | ,, |
| August 10 ..... | ,, | 2 | ,, | ,, | ,, | ,, |
| ,, 13, 14 ..... | ,, | 3 | ,, | ,, | ,, | ,, |
| ,, 21, 22, 23 ..... .. | ,, | 2 | ,, | ,, | ,, | ,, |
| September 27, 28 ..... | ,, | 3 | ,, | ,, | ,, | ,, |
| October 22, 23 ..... | ,, | 2 | ,, | ,, | ,, | ,, |
| ,, 25, 26 ..... | ,, | 1·8 | ,, | ,, | ,, | ,, |
| November 24, 28, 29 ... | ,, | 2 | ,, | ,, | ,, | ,, |

In each case the relative expectancy of heavy falls for the particular month is taken.

For the whole year the expectancy of heavy fall (0·4 in. and over) for any one day being assumed at 100, I find that the expectancy for the first decade of any month is 94, for the second decade 104, but for the 23rd to 28th, inclusive, 129.

In the Greenwich (1 in. and over) rainfalls 1815–68, the total amount of these great falls for the first decade of *all* months combined is 25·56 in. ; for the next 11 days, 39·70 in. ; and for the last

decade (raising the 31st proportionally) 57·70 in. This corresponds with the results of more moderate falls, as above.

Of course, I do not assume a mere "monthly periodicity;" but all my study tends to shew me the high probability that the position of the sun with regard to the earth does somehow give a distinctive character to each day of the year, in mean expectancy of wet or dry, &c., &c., so that, on the average, the same wet and dry days tend to recur yearly.

Why some of the great outbursts of solar reaction should be separated from each other by about 30 days' interval, I cannot guess. But the *fact* is indubitable to all those that will work it out.—I am, dear Sir, faithfully yours, P. H. NEWNHAM.

*Maker Vicarage, Devonport, August 10th*, 1880.

## HEAVY RAINFALL.

*To the Editor of the Meteorological Magazine.*

SIR,—A remarkable rainfall, I think I may say unexampled here in this century, occurred on Saturday, 17th inst., between 2.15 and 4.5 p.m. We had been having a good deal of rain—3½ inches since 1st inst.—but the 14th, 15th and 16th were fine, and the 17th was also fine and sultry, but becoming more and more cloudy towards 1 p.m. In 1 hour and 50 minutes there fell at Stevenstone (the Hon. Mark Rolle's Mansion) 3·05 in.; at this place, three quarters of a mile west from Stevenstone, 1·91 in.; at Torrington, 1¼ miles west from this place ·95 in. A few miles east of Stevenstone there was little or no rain. At Budleigh, in East Devon, we only had an evening shower of ·17 in., but at South Molton, 16 miles north-east from here, there was a terrible hail storm, of which you will doubtless receive accounts, but a sample leaf of mangle (or mangold) has reached me which looks like a Peninsular flag! The rainfall here for this month is already 6·16 in.! At Budleigh it is 2·10 in. Budleigh is about 45 miles from Little Silver as the crow flies. There we have only just had rain enough, and everything agriculturally looks more than well. Here no harm to speak of has been done to crops, there being no wind whatever last Saturday, and generally they promise well.—Yours faithfully, R. H. LIPSCOMB.

*Little Silver, Torrington, N. Devon, July 23rd*, 1880.

## THE WEATHER IN JULY.

As in the case of its immediate predecessor, July opened with very unsettled weather. A depression off the north coast of Scotland was in motion from W. to E. on the 1st, and arrived over Norway on the next day, followed on the 3rd by another, well-defined, but moving very slowly; also subsidiary depressions over England. By the following day the centre of this depression had reached the Dutch coast, and on the 5th was over Denmark. In the rear pressure increased generally; readings on the 5th were highest off our S.W. coasts, and gradients for W. to S.W. winds were slight.

Temp. below the average throughout our Islands, especially in the Midland Counties, S., and N.W. England. The highest readings were registered in the west and south on the 4th or 5th; the lowest occurred mostly on the 5th; but in some parts of the English Midland and Eastern Counties on the 2nd or 3rd.

Rainfall rather less than the mean in N.E. and S.W. England; about equal thereto in central and N.W. England; but more than the average elsewhere.

Bright sunshine was of somewhat shorter duration than during the last week of June in Scotland and N.W. England, but exceeded it in all other districts. The per-centage of total possible duration was in the north and north-west of England as low as 21 to 23, and the maximum was only 40 (in the south-west).

A continuance of similar conditions characterized the week (6th–12th). Readings were highest over France during the whole period. A depression was over the North Sea between Norway and Scotland on the 7th, and many subsidiary disturbances appeared over Ireland and England. The only difference on the next day was that the depression had become better defined. The charts of the 9th, however, shewed that the main depression had begun gradually to fill up; but several small shallow depressions in various districts caused the weather to remain very unsettled and showery. A general increase of pressure took place on the day following, but the depression still maintained the same position, and small subsidiaries were reported from our south-western coasts and the Netherlands. The centre of the depression had shifted eastwards by the 11th, and still further at the close of the week, and there was no continuance of subsidiary disturbances. As a consequence, the bar. rose considerably over the north of Scandinavia, and in a less degree over France and our Islands; readings became fairly uniform, although rather higher in western France than elsewhere.

Temp. again less than the average throughout our Islands, the deficit ranging from 1° in Scotland to 4° in eastern, central, and southern England. The maximum was 75° at Rothamstead, 74° at Nottingham, and 73° at Durham and Cambridge; the minimum, 43° at Hillington and Durham, 44° at Blackpool, and 45° at Aberdeen, Glenalmond, Leith, and Churchstoke.

Rainfall above the mean everywhere, except W. Scotland. The excess was as much as 2·54 in. at Barnstaple, and 2·28 in. at Shrewsbury; while at Londonderry it was only 0·03 in., and at Dover 0·05 in.

Bright sunshine showed a slight increase over the preceding week in Scotland and N.W. England, but a falling off elsewhere. The maximum duration ranged from 45 hours at Glasgow, and 42 hours at Southampton and in the Isle of Man, to 16 hours at Armagh, 21 hours at Dublin, and 23 hours at Parsonstown.

The weather during the week (13th–19th) was fair in E. Scotland and S.W. England, but elsewhere dull, unsettled, and very showery. On the 13th the bar. was falling over Wales and in the South-west of England, whilst in all other parts of our Islands a slight rise took place, and in Scandinavia a brisk rise—hence the lowest readings were over Wales. By the next day this area of low readings had moved a little to the southward of the position which it occupied on the day before, and, meanwhile, a decrease of pressure took place over France. Barometric readings thus became highest to the northward of Scotland, and pressure was very irregularly distributed over our southern districts and the North Sea. Next day pressure decreased somewhat over the whole of our islands; rather more so in the southern parts than elsewhere. Its relative distribution, however, was little altered. This large area of low readings over the south became very much smaller in the course of the day (15th), and the bar. rose briskly within that district. In the north, whence the highest readings were reported, the bar. fell slightly; over Scandinavia, also, it fell, and an area of low pressure was shewn over the Gulf of Bothnia. During the day following pressure increased in the south, and decreased in the north; readings thus becoming very uniform over the whole of Western Europe; during the next day a decided decrease occurred over the whole of the United Kingdom, the eastern shores of the Baltic, and the north of France; but the general distribution of pressure was little affected by the change.

Temp. was about equal to the average for time of year over Scotland and S. England, slightly below it elsewhere. The max. was 79° at Strathfield Turgiss and Southampton, 78° at Barnstaple; the minimum 43° at Nairn, 44° at Churchstoke, and 45° at Markree Castle.

Rainfall less than the mean in E. Scotland and S.W. England, about equal thereto in N. Ireland, but in all other districts the fall was above the average. Heaviest falls, 2·86 in. at Llandudno, 2·61 in. at Leicester, and 2·51 in. at Silloth; slightest, 0·02 in. at Plymouth, 0·04 in. at Aberdeen, and 0·05 in. at Falmouth.

Bright sunshine slightly more continuous in Ireland, south-western and central England, and E. Scotland, than during the week preceding, but in all other parts of the United Kindom it was much less prevalent. Maximum duration, 50 hours at Churchstoke, and 41 hours at Cirencester; minimum duration, six hours at Durham, and eight hours at York. The values for Durham and York are only 5 and 7 per cent. respectively of the total possible duration.

Fine weather was experienced in England and Ireland during the first two days of the next week (20th–26th), but for the rest of that period overcast skies and very showery, unsettled weather prevailed. In Scotland fine weather was experienced throughout the week.

On the 20th the bar. rose in all parts of our islands, and readings became much more uniform. During the next three days the changes in the distribution of pressure were very unimportant. On the 24th pressure decreased in all parts of Western Europe, but the change being moderately uniform, the distribution of pressure was little affected.

Temp., except in W. Scotland, was slightly below the average. The highest reading was only 80° at Nottingham, 79° at Rothamstead, and 76° at Durham, Cambridge, Loughborough, and Strathfield Turgiss; the lowest of the minima (42° at Markree Castle, and 43° at Parsonstown) occurred at most stations early in the morning of the 21st. The lowest of all the minima (40° at Nairn) occurred on the 25th.

Rainfall less than the mean in Scotland, more elsewhere; heaviest falls, 2·22 in. (1·62 in. above average) at Falmouth, and 2·14 in. at St. Leonard's and Londonderry; lightest falls, 0·07 in. at Aberdeen, 0·08 in. at Ardrossan, and 0·15 in. at Laudale. In N.E. and N.W. England, and S. Ireland the excess was not large.

Bright sunshine this week shewed an improvement upon the preceding, but the number of hours was still rather small. Maximum duration, 67 hours at Valentia, and 56 hours at Aberdeen; minimum duration, 25 hours at York and Churchstoke, and 34 hours at Durham.

During the remainder of July the weather was dull and very rainy in nearly all parts of the United Kingdom.

During the night (25th–26th) a large depression advanced to our south-western coasts, causing the bar. to fall over the whole of our islands—the change in the south-west amounting to nearly half-an-inch. It continued to advance eastwards during the 26th, and by 8 a.m. on the 27th was shewn over the S. of Scandinavia, Denmark, and a part of the Baltic. In its rear a moderately brisk recovery began; but there were indications of a fresh fall, which indications were verified by the appearance of a small but well-defined depression over the northern half of Ireland. This travelled away, taking a tortuous course in a north-easterly direction, during the 28th, and was over the extreme N. of Scotland on the morning of the 29th. In the meantime a secondary disturbance advanced to over S. Wales and the W. of England, and thence to the Shetland Isles, where it halted. During the night (29–30th) another secondary depression travelled across the S. of England, until its centre was, on the morning of the 30th, in the neighbourhood of London. Both disappeared in the course of the day, the wind veered to W. or N.W. very generally, and the sky cleared in most places.

Temp. below the average throughout our islands. In most districts the deficit was 3°, but in E. England, 4°. Both the maxima and the minima were very low for the time of year, the highest reading being 75° in London on the 27th and 28th, and the lowest of the minima 41° on the 30th at Parsonstown. In most districts the lowest readings ranged from 43° to 45°

Rainfall in excess of the average everywhere. In E. Scotland, N. Ireland, Central and Southern England the excess was rather large.

Bright sunshine was of longer duration than previously in the Western Central and North-Eastern parts of Great Britain, but elsewhere there was a decrease.

*Lowestoft.* H. E. M.

NOTE.—Thunderstorms were of frequent occurrence during the month in many districts.

## SUPPLEMENTARY TABLE OF RAINFALL IN JULY, 1880.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 5·14 | XI. | Corwen, Rhug ..... | 7·25 |
| ,, | Margate, Acol ..... | 3·13 | ,, | Port Madoc ..... | 8·40 |
| ,, | Littlehampton ..... | 3·20 | ,, | Douglas..... | 4·66 |
| ,, | St. Leonards ..... | 4·00 | XII. | Carsphairn ... ..... .. | 4·25 |
| ,, | Hailsham ..... | 3·28 | ,, | Melrose, Abbey Gate... | 3·90 |
| ,, | I. of W., St. Lawrence. | 2·64 | XIV. | Glasgow, Queen's Park. | 4·18 |
| ,, | Alton, Ashdell..... | 4·96 | XV. | Islay, Gruinart School.. | 2·43 |
| III. | Great Missenden..... | 5·79 | XVI. | Cupar, Kemback..... | 2·34 |
| ,, | Winslow, Addington ... | 8·24 | ,, | Aberfeldy H.R.S. ..... | ... |
| ,, | Oxford, Magdalen Col... | 5·05 | XVII. | Tomintoul..... | 4·48 |
| ,, | Northampton ..... | 7·36 | ,, | Keith H.R.S. ..... ..... | 7·22 |
| ,, | Cambridge, Merton Vil. | 3·78 | ,, | Forres H.R.S. ..... ... | 3·40 |
| IV. | Harlow, Sheering ..... | 4·17 | XVIII. | Strome Ferry H.R.S.... | 2·76 |
| ,, | Diss ..... | 4·81 | ,, | Auchnasheen H.R.S. ... | ... |
| ,, | Swaffham ..... | ... | ,, | Lochbroom ..... | 3·85 |
| ,, | Hindringham ..... | 3·86 | ,, | Tain, Springfield..... | 3·10 |
| V. | Salisbury, Alderbury... | 4·03 | ,, | Loch Shiel, Glenfinnan. | 4·60 |
| ,, | Calne, Compton Bassett | 5·01 | ,, | Dalwhinnie H.R.S..... | ... |
| ,, | Beaminster Vicarage ... | 3·61 | XIX. | Lairg H.R.S. ..... | 4·70 |
| ,, | Dartmoor, Princetown.. | ... | ,, | Altnabreac H.R.S. ..... | 4·92 |
| ,, | Langtree Wick ..... | 9·53 | ,, | Watten H.R.S. ..... | 2·88 |
| ,, | Lynmouth, Glenthorne. | 5·29 | XX. | Fermoy, Glenville ..... | 4·58 |
| ,, | St. Austell, Cosgarne... | 4·59 | ,, | Tralee, Castlemorris ... | 5·29 |
| ,, | Taunton ..... | 5·58 | ,, | Cahir, Tubrid ..... | 4·59 |
| VI. | Bristol, Ashleydown ... | ... | ,, | Tipperary, Henry St.... | 6·04 |
| ,, | Ross ..... | 5·96 | ,, | Newcastle West ..... | 2·96 |
| ,, | Wem, Sansaw Hall..... | 7·84 | ,, | Kilrush ..... | 4·09 |
| ,, | Cheadle, The Heath Ho. | 6·12 | ,, | Corofin ..... | 5·26 |
| ,, | Bickenhill Vicarage ... | 6·01 | XXI. | Kilkenny, Butler House | 4·19 |
| VII. | Melton, Coston ..... | 6·39 | ,, | Carlow, Browne's Hill.. | 5·13 |
| ,, | Horncastle, Bucknall ... | ... | ,, | Kilsallaghan..... | 5·54 |
| VIII. | Walton-on-the-Hill..... | 4·94 | ,, | Navan, Balrath ..... | ... |
| ,, | Broughton-in-Furness .. | 4·25 | ,, | Athlone, Twyford ..... | 6·28 |
| IX. | Wakefield, Stanley Vic. | 6·48 | ,, | Mullingar, Belvedere... | 6·90 |
| ,, | Ripon, Mickley ..... | 5·74 | XXII. | Ballinasloe ..... | 5·81 |
| ,, | Scarborough..... | 4·89 | ,, | Clifden, Kylemore ..... | 4·64 |
| X. | Mickleton..... | 5·35 | ,, | Crossmolina, Enniscoe.. | 3·89 |
| ,, | Haltwhistle, Unthank.. | 6·48 | ,, | Carrick-on-Shannon ... | 5·17 |
| ,, | Shap, Copy Hill ..... | 3·96 | XXIII. | Dowra ..... | 4·76 |
| XI. | Llanfrechfa Grange . ... | 7·08 | ,, | Rockcorry..... | 5·39 |
| ,, | Llandovery ..... | 9·59 | ,, | Warrenpoint ..... | 3·24 |
| ,, | Solva ..... | 3·02 | ,, | Newtownards ..... | 7·28 |
| ,, | Castle Malgwyn ..... | 4·10 | ,, | Carnlough..... | 5·26 |
| ,, | Rhayader, Nantgwillt.. | 6·66 | ,, | Bushmills ..... ..... | 4·49 |
| ,, | Carno, Tybritle ... ..... | 6·44 | ,, | Buncrana ..... | ... |

# JULY, 1880.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1860–5 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date. | Min. Deg. | Date. | No. of Nights below 32° In shelter. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | Camden Square | 5·10 | + 3·31 | ·85 | 3 | 23 | 79·2 | 25 | 47·5 | 31 | 0 | 0 |
| II. | | Maidstone (Hunton Court) | 2·60 | + ·96 | ·46 | 25 | 23 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss | 4·73 | ... | 1·09 | 14 | 21 | 78·5 | 16 | 45·3 | 5 | 0 | 0 |
| III. | | Hitchen | 4·88 | + 2·98 | ·66 | 11 | 25 | 72·0 | 18 | 47·0 | 4,30 | 0 | 0 |
| ,, | | Banbury | 5·33 | + 3·27 | ·72 | 14 | 27 | 74·8 | 23 | 43·0 | 10 | 0 | ... |
| IV. | | Bury St. Edmunds (Culford) | 4·59 | + 2·60 | 1·24 | 21 | 23 | 80·0 | 16 | 43·0 | 4 | 0 | 0 |
| ,, | | Norwich (Cossey) | 4·62 | + 2·65 | ·79 | 26 | 24 | 78·0 | 16 | 45·0 | 21 | 0 | 0 |
| V. | | Bridport | 3·43 | + 1·32 | ·73 | 30 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple | 7·14 | + 4·28 | 1·79 | 9 | 20 | 79·0 | 23 | 47·0 | 14 | 0 | 0 |
| ,, | | Bodmin | 4·32 | + 1·21 | 1·45 | 25 | 21 | 74·0 | 20 | 50·0 | 15 | 0 | 0 |
| VI. | | Cirencester | 7·32 | + 4·88 | 1·67 | 14 | 23 | ... | ... | ... | ... | ... | ... |
| ,, | | Shifnal (Haughton Hall) | 5·49 | + 3·32 | ·72 | 6 | 26 | 74·0 | 23 | 45·0 | 5,11 | 0 | 0 |
| ,, | | Tenbury (Orleton) | 5·08 | + 2·70 | ·61 | 25 | 23 | 74·5 | 17 | 42·5 | 5 | 0 | 0 |
| VII. | | Leicester (Town Museum) | 6·74 | ... | 1·21 | 14 | 24 | 73·0 | 23 | 47·0 | 3 | 0 | 0 |
| ,, | | Boston | 5·70 | + 3·40 | 1·55 | 14 | 17 | 79·0 | 21 | 45·0 | 5 | 0 | ... |
| ,, | | Grimsby (Killingholme) | 5·80 | ... | 1·10 | 14 | 25 | 70·5 | 18* | 47·0 | 5 | 0 | ... |
| ,, | | Mansfield | 6·13 | ... | ·94 | 26 | 25 | 71·5 | 25 | 47·2 | 21 | 0 | 0 |
| VIII. | | Manchester (Ardwick) | 5·32 | + 2·79 | ·75 | 18 | 23 | 78·0 | 17 | 51·0 | 31 | 0 | 0 |
| IX. | | York | 5·76 | + 3·82 | ·66 | 26 | 23 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) | 7·26 | + 4·03 | ·78 | 2 | 26 | 78·0 | 17 | 46·0 | 7 | 0 | 0 |
| X. | | North Shields | 4·67 | + 2·86 | ·55 | 27 | 25 | ... | ... | ... | ... | ... | ... |
| ,, | | Borrowdale (Seathwaite) | 10·05 | + 1·91 | 1·16 | 18 | 25 | ... | ... | ... | ... | ... | ... |
| XI. | WALES. | Cardiff | 6·64 | ... | ·98 | 17 | 23 | 72·3 | 16 | 47·4 | 31 | 0 | ... |
| ,, | | Haverfordwest | 4·19 | + ·89 | ·86 | 31 | 14 | 77·0 | 17 | 44·0 | 30 | 0 | 0 |
| ,, | | Aberdovey | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno | 6·67 | + 4·38 | 1·16 | 14 | 19 | 71·7 | 17 | 49·0 | 21 | 0 | 0 |
| XII. | SCOTLAND. | Cargen | 3·51 | + ·79 | ·76 | 13 | 19 | 74·8 | 17 | 45·0 | 21 | 0 | ... |
| ,, | | Hawick (Silverbut Hall) | 4·93 | ... | ·96 | 10 | 18 | ... | ... | ... | ... | ... | ... |
| XIV. | | Douglas Castle (Newmains) | 5·30 | ... | 1·55 | 24 | 21 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Long (Arddaroch) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Kilmory | 3·32 | ... | ·87 | 27 | 14 | ... | ... | 42·0 | 21 | 0 | ... |
| ,, | | Mull (Quinish) | 2·18 | ... | ·77 | 5 | 18 | .. | ... | ... | .. | ... | ... |
| ,, | | Loch Leven | 3·70 | + 1·13 | ·90 | 2 | 11 | ... | ... | ... | ... | ... | ... |
| XVII. | | Arbroath | 3·55 | + 1·00 | ·83 | 1 | 14 | 72·0 | 5,25 | 48·0 | 30 | 0 | ... |
| ,, | | Braemar | 4·00 | + 1·72 | ·88 | 3 | 20 | 72·2 | 17 | 38·5 | 13 | 0 | 0 |
| XVIII | | Aberdeen | 3·27 | ... | 1·07 | 28 | 18 | 70·0 | 25 | 45·0 | 8 | 0 | ... |
| ,, | | Portree | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Inverness (Culloden) | 5·98 | + 3·31 | 1·57 | 8 | 12 | 72·6 | 16 | 42·8 | 5 | 0 | 0 |
| XIX. | | Dunrobin | 3·50 | + 1·75 | ·61 | 6 | 18 | 67·8 | 25 | 44·0 | 6,31 | 0 | ... |
| ,, | | Sandwick | 3·55 | + 1·66 | ·76 | 28 | 15 | 65·0 | 24 | 44·8 | 22 | 0 | 0 |
| XX. | IRELAND. | Cork | 1·84 | ... | ·49 | 25 | 19 | 85·0 | 22 | 44·0 | 30 | 0 | ... |
| ,, | | Darrynane Abbey | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Waterford | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Killaloe | 6·14 | + 2·95 | 1·03 | 17 | 24 | 82·0 | 17† | 40·0 | 31 | 0 | ... |
| XXI. | | Portarlington | 6·10 | + 2·56 | 1·16 | 17 | 24 | 74·0 | 17 | 44·0 | 16 | 0 | ... |
| ,, | | Monkstown | 7·12 | + 4·69 | 1·34 | 12 | 20 | .. | ... | ... | ... | ... | ... |
| XXII. | | Galway | 6·58 | ... | 1·28 | 17 | 20 | 72·0 | 17‡ | 46·0 | 31 | 0 | ... |
| XXIII | | Waringstown | 4·72 | ... | ·64 | 27 | 22 | 80·0 | 4 | 42·0 | 20 | 0 | 0 |
| ,, | | Londonderry | 7·28 | ... | 2·03 | 2 | 20 | 69·0 | 25 | 49·0 | 31 | 0 | 0 |
| ,, | | Edenfel (Omagh) | 4·72 | ... | 1·48 | 27 | 25 | 79·0 | 17 | 40·0 | 30 | 0 | ... |

* And 25. † And 24. ‡ And 18, 23. ‖ And 31.

+ Shows that the fall was above the average; — that it was below it.

# METEOROLOGICAL NOTES ON JULY.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—Harvest prospects have become rather various, in consequence of the R having beaten down the best crops of wheat and barley. Grass plentiful. Camomile in flower on 1st; horned poppy on 11th.

HITCHEN.—The wettest July since 1875; temp. below the average of thirty years.

BANBURY.—An unusual amount of T and L; R exceedingly heavy on several occasions. The greater part of the grass not yet cut, and very little carried. High wind on 4th; H on 11th and 30th.

CULFORD,—A month of very unfavourable weather, proving in many instances destructive to the hay crop as well as injurious to corn. Mean temp. 61°·5; rainfall excessive; on the 21st, 1·24 in. fell in less than an hour, causing destructive floods. T occurred on 13 days. The weather was cold, and sunshine deficient.

COSSEY.—The total rainfall of the month was the same as that of July, 1879, but the heavy falls being further apart we escaped disastrous floods such as occurred then. The wheat crops are much laid; barley looks well, but much hay is still exposed to the weather.

BODMIN.—Average temp. 62°·1; no TSS during the month.

CIRENCESTER.—A very wet month, the greater part of the R being in T showers. On the evening of the 14th about 1·50 in. of R fell in less than half-an-hour; many cellars flooded.

SHIFNAL.—A month of TSS and R, the fall far exceeding that of July, 1879, but frequent sunshine relieved it. Temp. very low, not reaching 70° till the 11th, and only once reaching 74°. Bar. unusually equable. T, either near or distant, most days, the TS at 8 p.m. on 17th being fearfully severe. No wasps, and no butterflies but white. Potato blight appeared first on 22nd.

BOSTON.—The month has been remarkable for the constant succession of TSS and heavy R. Water stands on the land everywhere and the rivers are in full flood. On the Welland the inundations have been very severe, and the waters have risen higher than was ever known before. At Stamford the water rose as high as the pockets of the billiard table at the "George Hotel," and in the villages about Deeping Fen many of the streets were from three to four feet deep in water. The whole of the wash lands on the Welland are deep in water and 3000 acres of cropping totally destroyed.

KILLINGHOLME.—A month remarkable for T, L and R; the wettest July for many years; much hay still out; root crops abundant, but much fear is felt about the corn, which at the beginning of the month was very promising; L on nine days, T on fourteen.

MANSFIELD.—A very wet month; TSS on five days, and T or L on six others.

ARNCLIFFE.—Rainfall about an inch less than in July, 1879; much T and many TSS; a disastrous month for haymakers.

NORTH SHIELDS.—TSS on four days.

SEATHWAITE.—An exceedingly wet July; two slight TSS.

## WALES.

HAVERFORDWEST.—Up to the 14th the weather was cool, but afterwards the days were warmer, sometimes sultry, and the nights uniformly warm. Air very thundery on the 9th, 17th, 26th and 30th; distant T heard, but no storm in this immediate locality. Heat very intense, and air most oppressive on 17th, and heavy storms in the E. and N.E. of the county. Hay crop splendid and saved in excellent condition; corn looks well though much beaten down by the heavy R on the night of the 30th, when ·80 in. fell in an hour and a half. The temp. reached or exceeded 70° only on ten days.

LLANDUDNO.—A very wet month, the rainfall being nearly thrice the average. The temp. and amount of sunshine were both decidedly below the average.

An unusual amount of T from 12th to 16th. Grain crops and potatoes look well, but hay much damaged.

SCOTLAND.

CARGEN.—Temp. of month nearly 1° below average; 24 hours less sunshine than the average. Harvest will be general in this neighbourhood about the middle of August.

HAWICK.—Severe TS on the afternoon of the 10th, ·86 in. of R fell in 25 minutes, the ground was white with H, and the low-lying parts of Hawick were flooded. Hay crop light, and nearly over at end of month.

QUINISH.—A very fine and warm month, excellent for cereals and early-sown root crops, but rather dry for late grass and turnips. Hay crop mostly secured in very good order. Prevailing wind, N.; no rough weather.

CULLODEN.—Month generally cold; no really hot days. Rainfall considerable; on the 24th ·88 in. fell in 40 minutes.

SANDWICK.—Temp. 0°·8 below the mean of 53 years. N.W. wind of about 40 miles an hour on 30th. Two peals of distant T on 11th.

IRELAND.

KILLALOE.—Unusually heavy rainfall with frequent TSS; temp. high and equable; hay harvest tedious.

MONKSTOWN.—A remarkably wet month, three days on which the fall exceeded one inch.

WARINGSTOWN.—Rather wet, but warm; crops splendid; potato disease showing on the 29th, but general crop safe as yet.

LONDONDERRY.—Temp. generally high, wind principally N.E.; TS with heavy H on 24th, completely destroying the crops in places.

## THE WINTER AND SPRING OF 1880 IN CANADA.

"Fearful tornadoes have been devastating various parts of Ontario and the Northern and Western States. The spring, this year, is remarkably backward; and, even in the western part of Ontario, the mildest part of the dominion, seeding is not completed. At the same time, the winter was so mild that it will be necessary to import ice for summer use here this season.—Ontario, April 30th, 1880."—*The Colonies*, May 22nd, 1880.

## THE JULY FLOODS.

THANKS to the thoughtfulness of several of our correspondents, we have received a large mass of valuable data respecting the damage produced by the floods, which resulted from the heavy rains of the latter part of July. It is, however, better to give one complete narrative than two partial ones, and moreover a record of heavy rains and of resultant floods is more appropriately printed in *British Rainfall*, than in these pages. For both these reasons we think it better to reserve our data for later use, but we must reprint one hand-bill issued as a supplement to a Stamford paper.

"FLOODS.

"In 1570, the north end of the Stamford Town Bridge was borne down by a flood, and rebuilt by William, Lord Burghley. In April, 1641, the Welland flowed half-way up to St. Mary's Church, and was 16 in. higher than the flood on Thursday, July 15th, 1880."

# SYMONS'S

## MONTHLY

# METEOROLOGICAL MAGAZINE.

CLXXVI.] SEPTEMBER, 1880. [PRICE FOURPENCE. *or 5s. per ann. post free.*


## THE BRITISH ASSOCIATION AT SWANSEA.

WHEN describing the poor meeting held at Sheffield in 1879, we said—"We hope that in 1881 things will turn round, for it would be unreasonable to expect a large attendance at Swansea, where the meeting is to be held in 1880." The Swansea meeting was even smaller than we expected, the total number present being only 914, which is very little more than attended the meeting in the same town thirty years before.

The list of the Meteorologists present is, however, not much shorter than that of those at Sheffield—26 instead of 30.

| | |
|---|---|
| Beaufort, W. M. | London. |
| Brady, Sir Antonio | Stratford. |
| Casella, L. P. | London. |
| Davies, Rev. R. P. | Fairford. |
| Elliot, R. | Hawick. |
| Ellis, W. H. | Exeter. |
| Evans, J., F.R.S. | Hemel Hempstead. |
| Everett, Prof. J. D., F.R.S. | Belfast. |
| Fordham, H. G. | Royston. |
| Galton, F., F.R.S. | London. |
| Gilbert, J. H., Ph.D., F.R.S. | Harpenden. |
| Glaisher, J., F.R.S. | Blackheath. |
| Harrison, J. P. | Sheerness. |
| Hopkinson, J. | Watford. |
| Howlett, Rev. F. | East Tisted. |
| Jackson, M. | Ramsgate. |
| Latham, Baldwin, C. E. | London. |
| Lefroy, Lt.-Gen. Sir J. H., F.R.S. | London. |
| Mello, Rev. J. M. | Chesterfield. |
| Muirhead, H., M.D. | Cambuslang. |
| Pengelly, W., F.R.S. | Torquay. |
| Ragona, Prof. D. | Modena. |
| Russell, Hon. F. H. R. | Richmond. |
| Smith, Prof. H. J. S., F.R.S. | Oxford. |
| Talmage, C. G. | Leyton. |
| Williams, C. J. B., M.D., F.R.S. | Cannes. |

There were very few meteorological papers, and not one local communication appears in the following list:—

| | |
|---|---|
| 1. Anderson, R. | On the necessity for a regular inspection of Lightning Conductors. |
| 2. Everett, Prof. J. D. | Report of the Committee on Underground temperatures. |
| 3. Fox, H. Courtenay. | On the synchronism of mean temperature and rainfall in the climate of London. |
| 4. Galton, F. | On determining the heights and distances of clouds. |
| 5. Latham, B. | Temperature of town water supplies. |
| 6. Muirhead, Dr. | On the length of the sun spot period. |
| 7. Preece, W. H. | On the best form of Lightning Conductors. |
| 8. Ragona, Prof. D. | On the laws of the change of speed and direction of the wind. |

## ON THE BEST FORM TO GIVE TO LIGHTNING CONDUCTORS.

Mr. W. H. Preece read a paper on this subject. The question was whether the lightning conductor should be a solid rod, or tubular, or flat. Snow Harris, Prof. Henry, M. de Melsens, and M. Guillemin advocated straps of great surface. Faraday strongly maintained that there was no advantage in strap or tube forms, as the surface does nothing in conducting the current. Mr. Preece had obtained the use of Dr. De La Rue's magnificent batteries, and had procured conductors of equal material, length and weight, but differing in form. A condenser charged from 3,400 cells afforded a very powerful source of electricity, more than forty-two microfarads being thus available to produce an enormous spark. Experiments made by heating and deflagrating wires through the different conductors left no doubt that these discharges do obey the law of Ohm, and therefore that the additional surface of flat and tubular conductors is of no advantage in their conductivity.

Prof. Osborne Reynolds rather doubted the conclusions of Mr. Preece, on account of our not knowing the conditions under which the electricity passes from the air into the surface of the conductor.

Prof. Ayrton thought the experiments should be tried with much greater difference of potential. The 3,000 cells would not produce a free spark of more than 1-40th of an inch long, whereas flashes of lightning might extend over miles.

Mr. Preece, in replying, pointed out that increased surface, though increasing its inductive capacity, did not add to its efficiency, which depended only on its conductivity.

## ON THE NECESSITY FOR A REGULAR INSPECTION OF LIGHTNING CONDUCTORS.

By Richard Anderson, F.C.S., A. Inst. C.E.

The author referred to a paper by M. W. de Fonvielle, "On the Advantage of keeping Records of Physical Phenomena connected with Thunderstorms," read before the Association in 1872, in which M. de Fonvielle recommended to the attention of the members the steps which had been taken by the French Government for obtaining

information regarding thunderstorms, and suggested that the Association should institute some organization for the collection of such data; arguing that it would be of much value to science, as well as to the public. Nothing, however, has been done by the Association since 1872; and the author not only confirmed the conclusions at which M. de Fonvielle arrived as to the desirability of collecting such data, but was of opinion that the organization should go further, and arrange for a regular inspection of all public buildings which had lightning conductors applied.

The necessity for this he demonstrated by adducing a number of striking cases where damage, more or less severe, had occurred to buildings, even though having lightning conductors attached to them. The cases now cited, he explained, were supplementary to those communicated in his paper on a similar subject to the Association in 1878. A few of the cases were as follows :—

In October, 1878, an elevated building situated at the back of Victoria Station, occupied as a furniture repository, was struck by lightning and sustained damage, although furnished with a $\frac{3}{4}$-inch by $\frac{1}{8}$-inch copper band lightning conductor and a tube of $\frac{5}{8}$-inch diameter rising above the iron crestings on the tower. The lightning shattered the cresting and bent the point of the lightning-rod, besides doing other damage to the building. On testing, the author found the resistance very great, and on opening out the earth-terminal found it imbedded in concrete.

On June 26th last, lightning struck All Saints Church, Lambeth, doing considerable damage, although there was a $\frac{3}{8}$-inch diameter copper-rope conductor on the west gable, with a copper tube rising 18 inches above. A stone cross about 50 feet from the conductor was thrown down, injuring the roof of the north aisle. On testing the conductor, the author found that it had no "earth" whatever, the rope being simply placed in 2 inches of loose rubbish. The copper was of very inferior quality; conductivity being 32·10 per cent., or about double that of iron.

The author concludes from this evidence that it is not sufficient merely that rods of copper should be attached to a building, but it is necessary that, after being fixed, they should be regularly inspected, to see if they are in good order, so as to be really efficacious.

## ON THE SYNCHRONISM OF MEAN TEMPERATURE AND RAINFALL IN THE CLIMATE OF LONDON.

By H. Courtenay Fox.

This was a sequel to the paper with the same title read by the author at Sheffield (*Met. Mag.* vol. xiv., p. 124). The following are the conclusions arrived at :—

A cold spring is very prone to be followed by a cold summer, a cold summer tends to be followed by a cold autumn, and a cold autumn has a slight tendency to be succeeded by a winter of low temperature. Warm summers are generally followed by warm

autumns. In no fewer than eight out of the twelve months (that is, in every one except February, March, May, and October) very low temperature tends to be prolonged into the succeeding month. If June, July, August, or December be warm, the next month will probably be a warm one also; two months, June and July, tend when very dry to be followed by dry ones. On the other hand, a dry August indicates the probability of a wet September. A wet December is apt to be succeeded by a wet January. In addition to the foregoing there are also a few instances in which the rainfall of certain months appears to be definitely related to antecedent extremes of temperature and *vice versâ*. Thus if August or September be warm the ensing September or October inclines to be wet. If, on the other hand, September or November be cold, the succeeding October or December is likely to be a dry month. If February, June, or July be very dry, the next month has a strong tendency to be warm; if January, March, or April be wet, we may also expect the next month to be a warm one, but a wet May or July gives a strong probability of cold weather in June or August respectively.

## ON THE LENGTH OF THE SUN-SPOT PERIOD.

By Henry Muirhead, M.D.

It is well known to all who take an interest in the phenomena of sun-spots, that men of science are far from being agreed as to the length of the period intervening between one maximum epoch and another. I should think, however, that those who wish to prove that our rain, our storms, terrestrial magnetism, harvests of grain and vintage, with commercial crises, &c., depend a good deal on how the sun gets his face besmirched, should first of all make sure of the real length of the sun-spot period. To help towards its fixation I beg to bring under the notice of the Section the following table arranged from Wolf's *latest corrected* relative sun-spot numbers, from 1770 to 1877. The numbers are arranged to correspond with Jupiter's period of 11·863 years. Each vertical column (save one) commences with the year in which Jupiter's heliocentric longitude is 263¾°. The last column is the summation. The dates of the cycles were chosen on the supposition that much of the sun's radiance arises from matter impinging on his atmosphere—just as so-called star-showers light up ours—and that when Jupiter is in or near the front of the sun's march in space (*i.e.*, hel. long. 263¾°) he intercepts a good deal of the meteoric aggregations which would otherwise impinge against the sun's envelopes, giving rise to sun-spots till sublimated. We know that comets whose aphelia are about as distant as Jupiter's orbit have periods of about five years; so meteoric matter may be supposed to take about two and a half years to come from Jupiter to the sun. Now please observe that the average minimum sun-spot epoch occurs about two and a half years after Jupiter is at R.A. 263¾°, and the maximum about six years after the minimum, that is, when we might expect Jupiter's

intercepting influence to be least. But leaving out of account this hypothesis, the fact remains—as the table shows—that the sun-spot period is not 10 years, nor 11, nor 11·1, but seemingly 11·863, corresponding with Jupiter's period. It is to this conclusion that I wish to call the attention of meteorologists and others, who wish to show a correspondence between their various periodicities and those of sun-spots. In 1875 I brought this before the Philosophical Society of Glasgow, and also produced evidence to show Jupiter's influence on terrestrial magnetism.

| Year of Jovian Period. | | July 19, 1770. | May 30, 1782. | April 29, 1794. | Feb. 17, 1806. | 3 days before 1818. | Nov. 10, 1829. | Sept. 19, 1841. | July 31, 1853. | June 10, 1865. | Sums of the numbers. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ... | 79 | 33 | 34 | 25 | 34 | 54 | 30 | 38 | 31 | 358 |
| 2 | .. | 43 | 22 | 22 | 15 | 22 | 59 | 20 | 19 | 16 | 238 |
| 3 | ... | 49 | 5 | 15 | 7 | 9 | 39 | 9 | 7 | 7 | 147 |
| 4 | ... | 40 | 21 | 8 | 3 | 4 | 22 | 13 | 4 | 37 | 152 |
| 5 | ... | 48 | 87 | 4 | 0 | 3 | 8 | 33 | 22 | 74 | 279 |
| 6 | ... | 28 | 105 | 10 | 1 | 1 | 11 | 47 | 51 | 139 | 393 |
| 7 | ... | 35 | 108 | 18 | 5 | 7 | 46 | 79 | 96 | 111 | 505 |
| 8 | ... | 63 | 111 | 39 | 14 | 17 | 97 | 100 | 96 | 102 | 639 |
| 9 | ... | 95 | 84 | 58 | 20 | 29 | 111 | 96 | 77 | 66 | 636 |
| 10 | ... | 90 | 53 | 65 | 35 | 40 | 83 | 64 | 59 | 45 | 534 |
| 11 | ... | 73 | 47 | 75 | 45 | 53 | 68 | 62 | 44 | 17 | 484 |
| 12 | ... | 68 | 40 | 50 | 44 | | 52 | 52 | 47 | 11 | 364 |
| | | | | | Dec. 29, 1817. | | | | | | |

## ON FINDING THE HEIGHTS OF CLOUDS.

Mr. Francis Galton read a paper on "Determining the Heights and Distances of Clouds." He said that this might be done by their reflection in a low pool of water and in a mercurial horizon. The calm surface of a sheet of water might be made to serve the purpose of a large mirror, in a gigantic vertical range-finder, whereby a sufficiently large parallax might be made for the effective measurement of clouds. The observation of the height and thickness of the different strata of clouds, and of the rates of movement, was at the present time perhaps the most promising, as it was the least explored branch of meteorology. As there were comparatively few places in England where the two conditions were found of a pool of water, well screened from wind, and of a station situated many feet in height above it, the author hoped, by the publication of this memoir, to induce some qualified persons, who had access to favourable stations, such as existed in Wales, to interest themselves in the subject, and to make observations. The necessary angles might be obtained with a sextant and mercurial horizon; but it would be convenient to have in addition a tripod stand, with a bar of wood across the top to support the mercurial trough, with some simple instrument for the rapid and rough measurement of altitudes.

## WEATHER PREDICTION.

*To the Editor of the Meteorological Magazine.*

SIR,—In a communication which you were good enough to insert in your last number I directed attention to the failure of Mr. Brumham's prediction of "very great heat" and "fine summer weather" in the last fortnight or three weeks of June. We have now another failure to chronicle, as Mr. Brumham also predicted that the month of July would have a "high mean temperature," and the reverse has been the case. The official figures in the weekly Weather Reports issued by the Meteorological Office are as follows:—Temperature for England (S.) for week ending July 5th, 3° below average; July 12th, 4° below average; July 19th, average; July 26th, 1° below average; August 2nd, 3° below average.

I agree with you, Sir, that we should be slow to do anything to discourage any honest and disinterested investigations into the laws of weather, even though they should be carried on upon lines which do not seem to us to promise any useful results. The chemical investigations of the alchemists in their search after the philosopher's stone, futile as that search was in reference to its immediate object, are said to have laid the foundations of the science of chemistry, and there can be no doubt that observations carried on by the old astrologers for the purpose of calculating horoscopes and other similar absurdities, did much to advance the science of astronomy. And in this point of view it is quite possible that the attempts made by Mr. Brumham and others to predict the character of coming seasons may bear unexpected fruit in some future generation, when the science of meteorology has reached the predictive stage. At the same time, I think you will, on reflection, admit that the numerous body of meteorologists who, like myself, are convinced that Meteorology has not yet reached the stage which would justify attempts at seasonal predictions, are within their rights in endeavouring to divert the industry and perseverance of such men as Mr. Brumham into what they think to be more profitable channels of investigation. And, therefore, if you will allow me to say so, I think you ask us to concede a little too much when you claim our "sympathy and support" on behalf of the school represented by Mr. Brumham. Let me try to illustrate my meaning by an analogy taken from another science. A person who persisted in boring for coal amidst strata where the established facts of geology showed that it was impossible, or, at least, highly improbable that coal should be found, could hardly expect to have the sympathy and support of geologists with him in his enterprise, even though he were actuated by the most disinterested motives, and had spent much time and energy in the prosecution of the work, from which he expected no personal profit. And, though the analogy is not in all respects exact, this seems to me to be a fair illustration of the position, with reference to the great majority of meteorologists, of Mr. Brumham and the

numerous class of weather prophets who claim to be able to make predictions based on "lunar laws of the weather."

And though, as you rightly remind us, ridicule is somewhat out of place in a discussion of this kind, I think even you, Sir, must admit that the dogmatic and confident tone adopted by many of the weather prophets in enunciating their theories is calculated to provoke, if it does not justify, a little sarcasm from the sceptically inclined, when the theories break down. Take, for instance, the following utterance of Mr. Jinman, in the *Nautical Magazine* for April. Speaking of what he calls "the Eurydice storm and period," he writes:—"I have proved to demonstration that its return and its effect on the barometer, force and direction of wind, &c., can be calculated as readily as the elements of a solar eclipse." Again, "there is one, at least, who can tell by actual calculation, not only three days, but three weeks, months, or years, in advance." And once more, "the law of the circulation of our atmosphere is as perfect as the law which governs the solar system, the basis of the law being this,—the earth is girded parallel to and at right angles with the Magnetic equator by certain magnetic and electric cloud and earth-bands, and it is by the revolutions, crossings, reversings, and changes, *all of which can be calculated with mathematical precision*, that all atmospheric changes are produced." Now, when predictions announced in this style result in entire failure, is it not almost too much to expect an adverse critic to speak of them in that calm philosophic tone which should, as far as possible, pervade all scientific discussions?

But my scepticism is not by any means confined to prophecies of this kind. I maintain that the general result of recent weather predictions, including several by men of high standing in the scientific world, has been such as to establish my contention that meteorology has not yet reached the stage which can justify attempts to predict the weather of a year or even of a season. Take a few of the more notable of such prophecies within the past three or four years as specimens.

1st. In September, 1877, Professor Piazzi Smyth, in a communication published in *Nature*, announced that "the next cold wave" was "due" at the end of that year. And, in a subsequest communication, on which I cannot now lay my hands, he gave further particulars, if my memory serves me, tending to show that the coming winter should be one of very exceptional severity. The winter, however, was not marked by any exceptional cold, nor even by any prolonged period of ordinary cold.

2nd. In the same communication Professor Smyth announced that "the next great heat wave" might "be looked for in 1879·6" (which, translated into ordinary English, means, I suppose, about the middle of 1879), "within limits of half a year each way;" about as unfortunate a prophecy as could possibly have been made, inasmuch as the year 1879 proved to be one of the coldest years of the century, both as regards duration and intensity of cold.

3rd. It would appear that Professor Smyth has since seen reason to postpone the advent of his "heat-wave" to the present year, but as far as the present year has run, with no more credit to his reputation as a weather-prophet.

4th. Mr. Lowe, of Nottingham, whose character as an observer and naturalist stands so deservedly high, meets with no better fortune when he enters upon the dangerous field of prophecy. In a letter to the *Times*, dated May 16, 1879, he writes: "a period of drought is now apparently at hand, and the summer of 1879 may be expected to be very similar to that of 1868"(!)

5th. As I fear I have already trespassed too far upon your space, I will only give one more example. Mr. Roe, of Poyntington, writing also to the *Times*, under the appropriate date of St. Swithin's Day, 1879, after announcing his discovery that dry and wet periods succeed one another in triads of three whole years each, and giving a charmingly simple arithmetical rule for the determination of the time when a dry or wet period is due, predicts that the summer of 1880 will be the first of "a triad of hot and dry summers." Now, Sir, when these are the results of weather-predictions, even when taken in hand by men of the attainments of Professor Smyth and Mr. Lowe, are we not justified in surmising that there must be something radically faulty in methods of enquiry which lead to such results? And would it not be far better, until we have more reliable data upon which to found our forecasts, to drop the prophet's mantle, and instead of attempting weather-prediction on the grand scale, be content to labour at laying the foundations on which a future generation may, perchance, build up a really reliable system of weather prediction.

Yours very truly,

G. T. RYVES, F.M.S.

*Tean Vicarage, Stoke-on-Trent, Aug. 6th*, 1880.

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## WHITE AURORA BOREALIS ON AUGUST 12TH, 1880.

*To the Editor of the Meteorological Magazine.*

SIR,—After a period of rarity so marked and so long that it had all the charm of novelty, added to its own beauty, there was on August 10th one of the finest displays of aurora which I have seen. The circumstances were favourable for seeing its full beauty, this village being nearly a thousand feet above the level of the sea, and the sky not only free from visible cloud but also absolutely free from mist. A hot summer day had faded through a beautiful sunset—reddish-yellow, with a few distant cirri near the north horizon, and I was sitting in the open-air watching the August meteors, several of which were very fine, brighter than Arcturus, and left trains visible for two or three seconds. Suddenly at about 10.20 one of our party exclaimed, "What *is* that light?" I immediately replied, "A very fine aurora," for in less than a minute white streamers rushed up from the W.N.W., until one of them nearly reached the zenith. Within a

minute or two, a double arch of white was thrown from about W.N.W. to N.N.E., the lower arch wholly below the principal stars of Ursa Major, and the upper arch wholly above them. At 10.27 a streamer rose from nearly N.E., and reached into Cassiopea. At 10.34 there was a good streamer reaching from nearly the horizon, right through Ursa Major, and another at 11.7, which was perceptibly tinged with green. At 11.25 there was scarcely a trace of light, but afterwards about 11.35 there was a body of greenish white aurora in the N.N.W., in which the wave-like motion was extremely noticeable; the intensity of the pulsations soon decreased, but they were perceptible until nearly midnight.

G. J. SYMONS.

*Shap, Westmoreland, September 1st.*

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## RAINFALL PERIODICITY.

*To the Editor of the Meteorological Magazine.*

SIR,—Having noticed the tendency of heavy falls of rain to occur about the 25th of each month, as mentioned by Mr. Newnham in your last month's number, I have taken out the number of months in each year from 1872-9 inclusive (the eight years during which a record of rainfall has been kept here), in which the maximum fall in the 24 hours occurred between the 23rd and 28th of the month, that period of six days being specially mentioned by Mr. Newnham.

| | | |
|---|---|---|
| In 1872 | the maximum fall occurred between the 23rd and 28th of the month | in 6 months out of the 12 |
| 1873 | " " " | 3 " " |
| 1874 | " " " | 5 " " |
| 1875 | " " " | 0 " " |
| 1876 | " " " | 3 " " |
| 1877 | " " " | 2 " " |
| 1878 | " " " | 5 " " |
| 1879 | " " " | 4 " " |
| | Total ... | 28 |

Thus in the whole term of eight years or 96 months the maximum fall happened, within the period named, no less than 28 times; whereas, assuming the six days to be a fifth of the month, it should only have occurred 19 times, an excess of about 47 per cent. I am quite aware that eight years is too short a term on which to base any decided theories as to rainfall; still it is remarkable that the records here should bear out so strongly the tendency observed by Mr. Newnham.

I am, Sir, yours faithfully,

J. W. SCOTT.

*Muswell Hill, N., Sept. 3rd, 1880.*

[We have long entertained an indefinite impression roughly accordant with the above, and, in fact, an approximation to it will be found in Vol. II. of this Magazine, page 138, under the title of "Is the Royal Charter Gale Periodic?" Since receiving the above letter

we have worked up the corresponding data for the twenty-two years register kept at Camden Square by ourselves. The subject will be rendered more clear by a diagram, and is altogether too extensive for a postcript, and we will therefore merely say that the facts appear to us very striking, and that they conform generally to those stated by Mr. Scott. We will endeavour to put them clearly before our readers next month.—ED.]

## THE WEATHER IN AUGUST.

DURING the first two days the weather was showery generally, and very low temperatures for time of year were reported. The weather during the greater part of the next six days also was dull, very showery, and in some cases thundery. A favourable change took place on the 8th, and the 9th was very fine and bright in all except the extreme western parts of the kingdom.

The charts of the 3rd shewed high pressure over the Bay of Biscay, with a main area of *low* readings over Scandinavia, and a secondary depression over northern Germany. On the 4th a brisk decrease of atmospheric pressure began in the W. of Ireland, spreading slowly, until it comprised the whole of our islands and France, the change being very slight in the S.E., but moderately brisk on the N. and W. coasts of our islands and over the Bay of Biscay. The general distribution of pressure had, however, undergone but little change, except that, owing to the excess of decrease in the W. of France, the area of highest pressure was transferred to over N. Germany and north-western France. The charts of the 5th gave no sign of a coming improvement in general conditions. The depression which advanced to the N.W. of Scotland on the 3rd remained in the same position till the 7th, when it moved off across the North Sea; and a subsidiary that had developed over the English Channel dispersed. Pressure continued increasing in southern France, and a slight recovery took place in the S.E. of England; but elsewhere the mercury fell, the change in the S.W. being considerable, owing to the arrival over Ireland of a new depression from the Atlantic. This disturbance advanced eastward during the 7th, until at 8 a.m. on the 8th its centre was near Amsterdam. This depression was the cause of a gale on our S.W. and S. coasts, and of very heavy rain over the larger portion of the United Kingdom. At that stage of its progress the disturbance changed its course from an easterly to a northerly one, and on the morning of the 9th was over the Skager Rack. In its rear pressure increased; but the rise in the S.W. was very slight, and the advent of a fresh disturbance seemed likely. An anticyclone lay over the southern part of the Bay of Biscay, and a smaller area of high pressure over Ireland.

Temp. this week (3rd–9th) was rather above the average in E. Scotland, equal thereto in N.E. England, but slightly below it in all other parts of our island. The max. occurred mostly on the 5th, and in London was 78°. The lowest reading was at Markree Castle on the morning of the 9th, 40°.

Rainfall below the mean in E. Scotland and S.W. England, equal thereto in southern England, above elsewhere. Heaviest falls :—2·48 in. at Manchester, 2·05 in. at Stonyhurst, and 1·95 in. at Holyhead.

Bright sunshine was, at nearly all places, less prevalent than during the preceding week. The duration was wonderfully uniform, the per centage of total possible duration varying from 39 in N.E. England to 33 in central England and northern Ireland.

The weather during the next week, although dull at times, was much finer than during some time previous, and very dry.

During the night (9th–10th) the bar. rose over the whole of western Europe, and readings became uniformly high in France, England and Ireland. By the following morning this area had assumed much larger proportions, and embraced the N. of France, the whole of our islands, and a part of Scandinavia.

Over the Mediterranean and off our N.W. coasts areas of comparatively low readings were shewn. Next day (11th) pressure was increasing a little over Ireland, Scotland, and northern Scandinavia; but over the larger part of England and France a decrease took place; the anticyclone being thus shifted to over Scotland and Norway. The only difference in the appearance of the next day's charts was, that the anticyclone had "drawn in" somewhat. On the 13th and in the course of the night (13th–14th) a slight fall of the bar. occurred over the greater part of W. Europe; readings were comparatively high and very uniform over Scandinavia and the N. and W. of these islands, whilst the lowest readings were still reported from the S.E. of France. Quite insignificant were the changes in the distribution of pressure during the two following days, 14th and 15th. In the course of the 16th the bar. rose somewhat over the whole of our islands, most in the N., but fell slightly in S. France, where, however, a recovery soon began; hence readings varied from rather above 30·3 in. in Scotland to about 29·9 in. in the south part of the Bay of Biscay.

Temp. was more than the mean over the whole of our islands (especially so in Scotland and Ireland), except E. England, where it was about the mean. The max. were much in excess of those observed for a long time previous, the highest being 82° in N. Ireland, and 79° to 81° in most other districts. The min. occurred on the morning of the 10th, when the ther. fell to 45° in eastern and central England; the nights were, however, generally mild.

Rainfall almost nil, except in S. Ireland, and even there very slight.

Bright sunshine showed a large increase over the week previous, but nowhere was the per centage very great. Max. duration:—66 hours at Pembroke, 64 hours at York, 62 hours at Stonyhurst. Min. duration:—36 hours at Hillington.

During the next week (17th–23rd) the weather was very dry, although the sky was in most districts very cloudy.

A rather decided fall of the bar. began in the N. of our Islands during the 17th, while over France the mercury shewed an inclination to rise: hence the area of high pressure in the N. began to move slowly southwards. This fall of the bar. in the N. was interrupted during the night (19th-20th), while on the S.W. and S. coasts of England and Ireland the mercury rose slowly; the centre of the anticyclone consequently changing its position a little. During the next 24 hours barometric pressure increased somewhat over the whole of our islands—the rise being greatest in the N., so that the anticyclone returned to the position which it occupied prior to the decrease of the 19th. No appreciable change occurred during the remainder of the week.

Temp. was rather less than the mean over central England, and at some places in N.E., E., and N.W. England, but slightly more than the mean in the W. and S., as well as in E. Scotland. The max. was on no day very high, 78° at Barnstaple and in London being the highest. At Durham the ther. fell to 42° on the 20th, but elsewhere the minima were between 45° and 47°.

Rainfall very slight throughout our islands.

Bright sunshine, except in the S.W., was of extraordinarily short duration. Max. duration:—55 hours at Valentia, and 50 hours at Southampton and Pembroke. Min. duration:—2 hours at Churchstoke, 5 hours at Leicester, 11 hours at Kelstern (Lincolnshire), 12 hours at Cirencester, and 14 hours at York and Oxford.

The weather of the last week, although much brighter than during the preceding one, was again rather dull over the greater part of the kingdom, especially so over the inland districts. Thunderstorms occurred at many places on the 26th, and again at a smaller number of places on the 29th.

During the night (24th–25th) the bar. fell a little more appreciably than it had done for some days previous all along our W. and S.W. coasts, as well as over the Bay of Biscay, while scarcely any change occurred in the N.E. In the N. of Scandinavia, however, a decided rise took place. The bar. fell about a tenth of an inch over the whole of our islands during the 24 hours following, but rose in Scandinavia. In the meantime depressions of irregular shape

appeared over our W. and S. districts, and the weather became very unsettled. The relative distribution of pressure in N.W. Europe, however, underwent a complete change in the course of the night (26th–27th), owing to a rise of the bar. over the whole of our islands, amounting to 0·3 in. in S. Ireland, and to 0·1 in. on our N.E. coast. Pressure continued to increase during the next 24 hours over the whole of our islands, but decreased again in the course of the 28th and 29th.

Temp. above the average, the excess in S. England, in Scotland and Ireland being as much as 4° or 5°. The max. took place mostly on the 28th, when a temp. of 81° at Hastings and in London, and 80° in Ireland was recorded. The min. occurred on the 24th, when at Churchstoke 43° was registered.

Rainfall less than the mean in all parts of our islands, except at Valentia and Nottingham, where the rain measured amounted to 2·04 in. and 1·06 in. respectively.

Bright sunshine was more frequent than in the previous week, but the recorded number of hours was still rather small. Max. duration :—63 hours at York, 51 hours at Silloth, 48 hours at Valentia. Min. duration :—15 hours in London and 22 hours at Aberdeen and Durham.

*Lowestoft.* H. E. M.

## AUGUST METEORS.

THE August meteors were observed by Mr. W. F. Denning, at Bristol, and by Mr. H. Corder, at Writtle, in Essex. The former made observations every night during 6th to 13th inclusive, and recorded 419 shooting stars, of which 240 belonged to the shower of streak-leaving Perseids. There was a dense fog on the 10th, so that the apparent maximum occurred on the 9th, when meteors were falling at the rate of 44 per hour for one observer. Mr. Corder saw 415 meteors, including 254 Perseids, between July 29 and August 11, and he estimated that on the 10th, when the sky was very unfavourable to observation, there were 40 Perseids per hour. Mr. Denning noted a fair proportion of brilliant meteors. Several were equal to Venus, and many were comparable either to Mars or Jupiter, and the luminous streaks they left in their paths formed a conspicuous feature of the display, and enabled the directions of their flights to be registered with great accuracy.

## General Myer.

GENERAL ALBERT J. MYER, of the Signal Service in the United States, who for 22 years rendered invaluable service to that country in observing and reporting approaching changes in the weather, died in Buffalo, on the 24th of August, in the 52nd year of his age. General Myer became identified with the Signal Service when he was only 30 years old, and since then his name has become synonymous with that of this important service, and he has been familiarly known as "Old Probabilities." His services were equally valuable in peace or in war. In 1854 he entered the army as an assistant-surgeon. He was assigned to special duty in the Signal Service in 1858, and remained on that duty till 1860, when he was made chief signal officer of the army, with the rank of major. He was not the originator of the idea of making use of the telegraph for conveying information in regard to the weather—that honour is generally by Americans conceded to the late Professor Henry of the Smithsonian Institution—but General Myer took up the idea, developed and expanded it, and brought it into successful use. It is stated that 50 per cent. of the "probabilities" are fully verified, and 25 per cent. verified in part. The failures are only 25 per cent.—*Times, Sept. 9th.*

# SUPPLEMENTARY TABLE OF RAINFALL IN AUG., 1880.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 1·50 | XI. | Corwen, Rhug ..... | 2·27 |
| ,, | Margate, Acol ..... | 1·59 | ,, | Port Madoc ..... | 2·64 |
| ,, | Littlehampton ..... | ·90 | ,, | Douglas..... | ·67 |
| ,, | St. Leonards ..... | ·55 | XII. | Carsphairn ... ..... | ·55 |
| ,, | Hailsham ..... | ·41 | ,, | Melrose, Abbey Gate... | ·95 |
| ,, | I. of W., St. Lawrence. | ·57 | XIV. | Glasgow, Queen's Park. | ·76 |
| ,, | Alton, Ashdell..... | 1·32 | XV. | Islay, Gruinart School.. | 1·71 |
| III. | Great Missenden..... | ·98 | XVI. | Cupar, Kemback..... | ·65 |
| ,, | Winslow, Addington ... | ·84 | ,, | Aberfeldy H.R.S. ..... | ·00 |
| ,, | Oxford, Magdalen Col... | ·30 | XVII. | Tomintoul..... | 1·17 |
| ,, | Northampton ..... | ·69 | ,, | Keith H.R.S. ..... ..... | ·50 |
| ,, | Cambridge, Merton Vil. | 1·39 | ,, | Forres H.R.S. ..... | ·10 |
| IV. | Harlow, Sheering ..... | ·98 | XVIII. | Strome Ferry H.R.S.... | 2·35 |
| ,, | Diss ..... | 1·62 | ,, | Auchnasheen H.R.S. ... | ... |
| ,, | Swaffham ..... | 2·86 | ,, | Lochbroom ..... | ·69 |
| ,, | Hindringham ..... | 1·90 | ,, | Tain, Springfield..... | ·57 |
| V. | Salisbury, Alderbury... | 1·59 | ,, | Loch Shiel, Glenfinnan. | 3·40 |
| ,, | Calne, Compton Bassett | ·99 | ,, | Dalwhinnie H.R.S..... | ... |
| ,, | Beaminster Vicarage ... | ·63 | XIX. | Lairg H.R.S. ..... | ·84 |
| ,, | Dartmoor, Princetown.. | 1·20 | ,, | Altnabreac H.R.S. ..... | ·13 |
| ,, | Langtree Wick ..... | 1·15 | ,, | Watten H.R.S. ..... | ·27 |
| ,, | Lynmouth, Glenthorne. | ·98 | XX. | Fermoy, Glenville ..... | 1·64 |
| ,, | St. Austell, Cosgarne... | ·36 | ,, | Tralee, Castlemorris ... | ... |
| ,, | Taunton ..... | ·17 | ,, | Cahir, Tubrid ..... | 1·97 |
| VI. | Bristol, Ashleydown ... | ·53 | ,, | Tipperary, Henry St.... | 1·60 |
| ,, | Ross ..... | ·30 | ,, | Newcastle West ..... | ... |
| ,, | Wem, Sansaw Hall..... | 1·34 | ,, | Kilrush ..... | 2·01 |
| ,, | Cheadle, The Heath Ho. | 3·42 | ,, | Corofin ..... | 2·17 |
| ,, | Bickenhill Vicarage ... | ·90 | XXI. | Kilkenny, Butler House | 1·81 |
| VII. | Melton, Coston ..... | 1·57 | ,, | Carlow, Browne's Hill.. | 2·35 |
| ,, | Horncastle, Bucknall ... | 1·90 | ,, | Kilsallaghan..... | ... |
| VIII. | Walton-on-the-Hill..... | 1·75 | ,, | Navan, Balrath ..... | 1·63 |
| ,, | Broughton-in-Furness .. | 1·84 | ,, | Athlone, Twyford ..... | 1·78 |
| IX. | Wakefield, Stanley Vic. | 1·86 | ,, | Mullingar, Belvedere ... | 1·26 |
| ,, | Ripon, Mickley ..... | 1·91 | XXII. | Ballinasloe ..... | 2·30 |
| ,, | Scarborough..... | 1·96 | ,, | Clifden, Kylemore ..... | 3·07 |
| X. | Mickleton..... | 1·68 | ,, | Crossmolina, Enniscoe.. | 2·90 |
| ,, | Haltwhistle, Unthank.. | ·96 | ,, | Carrick-on-Shannon ... | 2·09 |
| ,, | Shap, Copy Hill ..... | 1·12 | XXIII. | Dowra ..... | 1·74 |
| XI. | Llanfrechfa Grange ..... | ·46 | ,, | Rockcorry..... | 1·09 |
| ,, | Llandovery ..... | ·82 | ,, | Warrenpoint ..... | 1·08 |
| ,, | Solva ..... | ·56 | ,, | Newtownards ..... | ·71 |
| ,, | Castle Malgwyn ..... | ·99 | ,, | Carnlough..... | 1·17 |
| ,, | Rhayader, Nantgwillt.. | 1·21 | ,, | Bushmills ..... ..... | 2·48 |
| ,, | Carno, Tybritle ..... | 2·06 | ,, | Buncrana ..... | ·98 |

# AUGUST, 1880.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1860–5 | Greatest Fall in 24 hours. Dpth | Greatest Fall in 24 hours. Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Max. Date. | Min. Deg. | Min. Date. | No. of Nights below 32°. In shade. | No. of Nights below 32°. On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | Camden Square | ·45 | — 2·19 | ·21 | 7 | 4 | 82·6 | 28 | 47·8 | 3 | 0 | 0 |
| II. | | Maidstone (Hunton Court) | 1·66 | — ·54 | ·74 | 26 | 9 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss | ·80 | ... | ·45 | 25 | 8 | 78·2 | 10 | 43·7 | 3 | 0 | 0 |
| III. | | Hitchen | 1·00 | — 1·35 | ·28 | 6 | 7 | 72·0 | 11* | 48·0 | 2, 6 | 0 | ... |
| ,, | | Banbury | ·78 | — 1·35 | ·37 | 5 | 9 | 76·5 | 28 | 46·0 | 24 | 0 | ... |
| IV. | | Bury St. Edmunds (Culford) | 1·27 | — 1·17 | ·31 | 7, 25 | 9 | 75·0 | 5 | 41·0 | 23 | 0 | ... |
| ,, | | Norwich (Cossey) | 2·74 | + ·84 | ·85 | 25 | 12 | 76·5 | 31 | 47·0 | 3 | 0 | ... |
| V. | | Bridport | ·53 | — 2·06 | ·18 | 7 | 4 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple | 1·45 | — 2·74 | ·45 | 25 | 9 | 80·5 | 15 | 58·0 | 2 | 0 | ... |
| ,, | | Bodmin | ·58 | — 3·28 | ·18 | 21 | 8 | 80·0 | 11 | 54·0 | 3 | 0 | 0 |
| VI. | | Cirencester | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Shifnal (Haughton Hall) | ·81 | — 2·06 | ·44 | 7 | 6 | 76·0 | 11 | 46·0 | 9§ | 0 | 0 |
| ,, | | Tenbury (Orleton) | ·32 | — 2·56 | ·12 | 1 | 6 | 80·0 | 10 | 43·7 | 10 | 0 | 0 |
| VII. | | Leicester (Town Museum) | 1·66 | ... | ·66 | 7 | 10 | 78·2 | 11 | 48·6 | 7 | 0 | 0 |
| ,, | | Boston | 2·42 | + ·13 | ·57 | 6 | 7 | 83·0 | 12 | 47·0 | 3 | 0 | 0 |
| ,, | | Grimsby (Killingholme) | 1·59 | ... | ·49 | 6 | 9 | 72·5 | 10 | 47·0 | 1 | 0 | ... |
| ,, | | Mansfield | 2·46 | ... | 1·35 | 7 | 11 | 77·9 | 10 | 44·0 | 1 | 0 | 0 |
| VIII. | | Manchester (Ardwick) | 2·77 | — ·74 | 1·84 | 8 | 7 | 79·0 | 11 | 52·0 | 8 | 0 | 0 |
| IX. | | York | 1·58 | — 1·13 | ·58 | 7 | 10 | 81·0 | 31 | 45·0 | 5 | 0 | 0 |
| ,, | | Skipton (Arncliffe) | 2·89 | — 3·05 | 1·45 | 5 | 10 | 80·0 | 11 | 42·0 | 2 | 0 | 0 |
| X. | | North Shields | 1·44 | — 1·41 | ·39 | 5 | 17 | ... | ... | ... | ... | ... | ... |
| ,, | | Borrowdale (Seathwaite) | 4·15 | — 9·93 | 2·60 | 4 | 9 | ... | ... | ... | ... | ... | ... |
| XI. | WALES. | Cardiff | ·77 | ... | ·27 | 2 | 7 | 78·4 | 11 | 50·1 | 10 | 0 | ... |
| ,, | | Haverfordwest | ·64 | — 4·24 | ·27 | 7 | 8 | 80·0 | 14† | 43·5 | 30 | 0 | ... |
| ,, | | Aberdovey | 3·04 | ... | ·68 | 6 | 8 | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno | 1·86 | — 1·96 | 1·17 | 7 | 5 | 71·0 | 10 | 50·5 | 1 | 0 | 0 |
| XII. | SCOTLAND. | Cargen | ·50 | — 3·69 | ·15 | 4 | 5 | 81·4 | 14 | 43·0 | 1 | 0 | ... |
| ,, | | Hawick (Silverbut Hall) | 1·55 | ... | ·37 | 4 | 10 | ... | ... | ... | ... | ... | ... |
| XIV. | | Douglas Castle (Newmains) | ·92 | ... | ·50 | 5 | 7 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Long (Arddaroch) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Kilmory | 2·43 | ... | 1·18 | 4 | 9 | ... | ... | 38·0 | 1 | 0 | ... |
| ,, | | Mull (Quinish) | 1·19 | ... | ·32 | 3 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | | Loch Leven | ·60 | — 3·08 | ·20 | 6 | 5 | ... | ... | ... | ... | ... | ... |
| XVII. | | Arbroath | ·59 | — 2·64 | ·17 | 4 | 9 | 78·0 | 11 | 47·0 | 1, 3 | 0 | ... |
| ,, | | Braemar | 1·23 | — 2·61 | ·75 | 7 | 7 | 76·0 | 28 | 39·2 | 31 | 0 | 1 |
| XVIII | | Aberdeen | 1·05 | ... | ·36 | 2 | 12 | 81·0 | 10 | 47·0 | 2 | 0 | ... |
| ,, | | Portree | 1·78 | — 5·67 | ·64 | 4 | 11 | ... | ... | ... | ... | ... | ... |
| ,, | | Inverness (Culloden) | ·55 | — 2·70 | ·30 | 8 | 4 | 75·0 | 29 | 45·0 | 8 | 0 | 0 |
| XIX. | | Dunrobin | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Sandwick | 1·00 | — 2·71 | ·71 | 5 | 6 | 70·8 | 12 | 48·0 | 1 | 0 | 0 |
| XX. | IRELAND. | Cork (Blackrock) | 1·16 | ... | ·40 | 5 | 9 | 89·0 | 27‡ | 45·0 | 8 | 0 | ... |
| ,, | | Darrynane Abbey | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Waterford | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Killaloe | 2·26 | — 2·67 | ·56 | 6 | 12 | 85·0 | 11 | 40·0 | 9 | 0 | ... |
| XXI. | | Portarlington | 2·44 | — 2·06 | ·91 | 6 | 13 | 78·5 | 15 | 46·0 | 6 | 0 | 0 |
| ,, | | Monkstown | 1·97 | — 1·24 | 1·11 | 7 | 8 | ... | ... | ... | ... | ... | ... |
| XXII. | | Galway | 2·09 | ... | ·80 | 6 | 9 | 79·0 | 29 | 45·0 | 9 | 0 | ... |
| XXIII | | Waringstown | 1·19 | ... | ·34 | 4 | 7 | 82·0 | 11 | 43·0 | 8 | 0 | 0 |
| ,, | | Londonderry | 1·49 | ... | ·97 | 4 | 7 | 76·0 | 12‖ | 49·5 | 2 | 0 | 0 |
| ,, | | Edenfel (Omagh) | 2·04 | ... | 1·30 | 4 | 7 | 87·0 | 14 | 39·0 | 1 | 0 | ... |

* And 28. † And 15. ‡ And 28. ‖ And 15. § And 10, 24.

\+ Shows that the fall was above the average; — that it was below it.

# METEOROLOGICAL NOTES ON AUGUST.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—The harvest has rapidly progressed under most favourable circumstances; perfect weather and abundant labour; yield better than was expected. Aurora borealis on the 12th.

BANBURY.—A very dry month, especially the last three weeks, and eminently favourable for the harvest; most of the white corn cut at the end of the month, and a good deal harvested; quality and yield good. Almost incessant L on the night of the 29th, but at considerable distance; T also on the 6th and 7th, and distant T and L on the 25th and 29th.

CULFORD.—The weather has been fine and seasonable, but the harvest has not progressed so rapidly as might have been expected; the absence of sunshine and the abundant undergrowth have retarded the carrying of the grain. Polar winds on 14 days; T on the 2nd, 23rd and 25th. Mean temp. of the month, 61°·3.

COSSEY.—A good harvest month with the exception of five dull but dry days in succession, during which the corn on shock did not harden.

BODMIN.—Mean temp. of the month, 61°·1. Many years have passed since so genial and beautiful an August has been witnessed.

SHIFNAL.—The persistent R with which the last month closed continued daily, with the exception of the 2nd and 4th, until the 9th, when a dry period set in, with wind varying from W. to E., which lasted until the end of the month; it was all that could be desired for the grain harvest, which proceeded uninterruptedly.

ORLETON.—A very dry and favourable month for the harvest; no R fell after the 7th, when a sudden gale of wind set in at 7 p.m. after an hour of calm; very warm with sunshine from 8th to 16th; the sky then became obscured by dull hazy clouds, and for more than six days the sun was never visible; the remainder of the month was fine and hot; the mean temp. was nearly half a degree above the average; the bar. was high and steady; distant T was heard on 6th and 7th, and faint L was seen on the nights of the 26th, 27th and 29th; wheat cutting commenced about the middle of the month.

LEICESTER.—TS on night of 29th, with continuous L from 11 p.m. to 2.30 a.m., and R from 1.30 a.m. to 2.30 a.m.; L also on evening of 26th, and aurora borealis seen at 10.30 p.m. on 12th.

GRIMSBY.—First week wet, rest of month very dry; many days were overcast; close of month splendid weather; corn carrying commenced at end of month, and its improved condition is beyond all expectation; T on 2nd and 26th, L on 27th and 29th, T and L on 6th.

MANCHESTER.—Showery till 7th, on which day R began at noon; the fall up to 3.30 p.m. was 0·70 in., from 3.30 to 6.30 there was a further fall of 0·65 in., from 6.30 p.m. to 11 p.m. 0·44 in., and from 11 p.m. to 9 a.m. on 8th 0·05 in., so that the total was 1·84 in. After this not a drop of R fell during the rest of the month.

YORK.—Remarkably fine month, especially after the 8th; the third week was very cloudy; T on 8th, and distant TS on the 29th.

NORTH SHIELDS.—TSS on 2nd, 5th, 6th and 8th, and T also on 3rd; aurora seen on 12th.

## WALES.

HAVERFORDWEST.—The driest, and one of the finest and warmest Augusts during the last 32 years; harvest prospects magnificent; green crops also exceedingly good.

ABERDOVEY.—Very hot all the month.

LLANDUDNO.—A very fine month, but haze or sea fog on 15 days.

## SCOTLAND.

CARGEN.—An unusually bright warm month; mean temp. 61°·8, which is about 3° above the average, and during the last 21 years there have only been two months with a higher mean temp., viz., July, 1872, and July, 1878. The grain crops in the neighbourhood have been well secured, and the greater portion is now in the stackyard; T on the 15th and 30th.

HAWICK.—Warm and most genial. Scarcely one grasshopper, and very few red butterflies or dragonflies to be seen. Wasps are, however, unprecedentedly numerous.

NEWMAINS DOUGLAS.—Distant T on afternoon of 3rd.

QUINISH.—A dry, hot month.

BRAEMAR.—A most excellent month for maturing the crops, the quality of which is unusually good; a very bright aurora seen on the 12th and 13th.

ABERDEEN.—Atmospheric disturbances have been prevalent during August; TS in the early days of the month, succeeded on the 12th and 13th by very brilliant displays of aurora borealis, the most vivid seen for many years in this neighbourhood. Temp. of the month very high, while the rainfall has been greatly below the average.

PORTREE.—The driest August on record. The weather has been very warm all through; grain crops are all cut, and two more weeks of fine weather will complete the harvest; it has never been known to be so early in this island before.

CULLODEN.—Rainfall very slight; from the 8th to the close of the month none fell; the weather during this period was exceedingly fine; many days warm and sultry, but without T; sunshine during many days brilliant, and atmosphere generally clear; weather most favourable for harvest, crops fair; a grand display of aurora on the 13th and 14th [? 12th and 13th.—ED.]

SANDWICK.—Rainfall less than in any August since 1846; the temp. was nearly 3° above the average, and the wind was moderate, so that the weather was splendid for the harvest, and the reaping of a luxuriant crop is now general; T and L on 5th; large solar halo seen on 7th; brilliant aurora on 12th, and fainter on the 13th.

## IRELAND.

KILLALOE.—The predicted wave of heat certainly was felt here in August, though not in June, the mean temp. having been 65°·4, by far the highest recorded here for many years. No finer harvest month could have been experienced; brilliant aurora from 9.35 to 10 p.m. on 12th.

MONKSTOWN.—With the exception of the first week, the weather was fine and dry with light easterly winds; hot sun and considerable haze during the day and copious dews at night; the last days of the month were very hot.

WARINGSTOWN.—A splendid month from the 7th, which will secure the best harvest we have had for 20 years.

LONDONDERRY.—Wind variable; harvesting operations have seldom been so general during this month; grain crops extremely heavy.

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## SEVERE WINTER IN AUSTRALIA.

AMONG the items of Australian news weather of unusual severity is reported, and especially in New South Wales. Heavy snow had fallen on the 20th July in the Braidwood district, lying at least 2 ft. deep on the roads, and causing great destruction of flocks. In the Cooma district one squatter lost 500 sheep. In South Australia the cold is reported to be intense, and the fall of snow on the Flinders Range the heaviest experienced for the last 20 years.—*Times, Sept.* 13.

SYMONS'S

MONTHLY

# METEOROLOGICAL MAGAZINE.

CLXXVII.] OCTOBER, 1880. [PRICE FOURPENCE. or 5s. per ann. post free.

## RAINFALL PERIODICITY.

IT is scarcely right to begin an article with a digression, but the subject upon which we have to write a few words has brought prominently if not painfully before us the muddle which characterizes the length of the calendar months. Of course we do not hope to live to see them adjusted, but if we had a regular system such as either A or B how we should pity the ignorance of those continuing with the set marked C.

| | Jan. | Feb. | March | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A... | 30 | 31 | 30 | 31 | 30 | 31 | 30 | 31 | 30 | 31 | 30 | 30 or 31 |
| B... | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 35 or 36 |
| C... | 31 | 28 or 29 | 31 | 30 | 31 | 30 | 31 | 31 | 30 | 31 | 30 | 31 |

However, we must leave the revision of the calendar to wiser and more powerful heads than ours, and go on with our own subject.

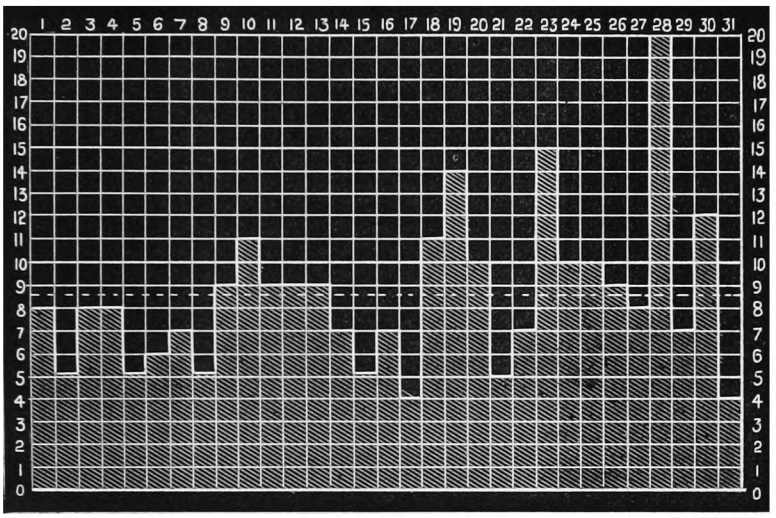
Every year must obviously yield 12 maximum falls, and these divided by the average number of days in a month give 0·39 or say 0·4 as the proportion due to each date. Thus, to take the case quoted by Mr. J. W. Scott, of an eight years register and six dates taken together, we have $0{\cdot}4 \times 8 \times 6 = 19{\cdot}2$ as the number of instances probable within the group of dates 23rd to 28th; at his station for the last eight years, instead of 19 it was 28, an excess of 47 per cent., which appears far too large to be accidental.

Our own register extends over 22 years, and consequently the probable instances for *each* date are $(0{\cdot}39 \times 22)$ 8·58. It seems to us that the very marked excesses shown by this register are worthy of study, and therefore we give the whole of the facts. The table requires no explanation except that in order to economize space the first two figures of each date are suppressed, therefore 1878 appears as 78 and so on. The figures and curve speak for themselves.

It may be only a coincidence, but if so it is a very remarkable one, that Mr. Newnham should specify the 23rd to 28th, that in a register

| Date. | Jan. | Feb. | March. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 75,79 | ... | ... | ... | ... | 61,65 | ... | 70 | ... | 71 | 63 | 67 | 8 |
| 2 | ... | 73 | ... | ... | .. | 60,67 | ... | ... | ... | ... | ... | 63,75 | 5 |
| 3 | ... | ... | 64,70 | ... | 69 | ... | 64,77 | 69,78 | 77 | ... | ... | ... | 8 |
| 4 | 73 | ... | 58 | . | ... | 58,68 | ... | 74,76 | 76 | ... | 62 | ... | 8 |
| 5 | ... | 59,60 | ... | 64 | ... | .. | ... | ... | ... | ... | 73 | 66 | 5 |
| 6 | 72 | 70 | 60 | ... | 64 | ... | ... | ... | ... | 68 | ... | 61 | 6 |
| 7 | ... | 71 | 75 | ... | 73,78 | ... | ... | ... | 70 | 58 | ... | 74 | 7 |
| 8 | 77 | ... | ... | 75 | 62,71 | ... | ... | 61 | ... | ... | ... | ... | 5 |
| 9 | ... | 66 | 67,73 | 62,74,77,79 | ... | ... | ... | 64 | ... | ... | ... | 62 | 9 |
| 10 | 66 | 79 | ... | 76,78 | 65,66 | ... | 71 | 60 | ... | 60 | 66,75 | ... | 11 |
| 11 | ... | 64,69,75 | ... | ... | 61,70 | 77 | 70 | ... | 67 | ... | 77 | ... | 9 |
| 12 | 63 | ... | 76 | ... | 60 | 59,62 | ... | ... | ... | 62,73,76 | 76 | ... | 9 |
| 13 | 70 | 58,77,78 | ... | ... | 72 | 64,69 | 73 | ... | ... | ... | 61 | ... | 9 |
| 14 | ... | ... | 63 | 65 | ... | ... | 75 | 58 | 73 | ... | 60,71 | ... | 7 |
| 15 | ... | ... | 71 | ... | ... | 76 | ... | ... | ... | 67 | 78 | 70 | 5 |
| 16 | ... | 67 | ... | ... | ... | 70 | 62 | 62 | 64 | ... | ... | 69,72 | 7 |
| 17 | ... | ... | 61 | ... | ... | ... | ... | 68,71 | 78 | ... | ... | ... | 4 |
| 18 | 68 | 63 | 79 | 71 | 63 | 63 | ... | ... | 69 | 66,69,75 | ... | 58 | 11 |
| 19 | 64,74 | 62 | ... | ... | 77 | 71 | 79 | 67,75,79 | 58,63 | 70,79 | ... | 64 | 14 |
| 20 | 60 | 76 | 62,69 | 67,68,72 | 59,67 | ... | ... | ... | 65 | ... | ... | ... | 10 |
| 21 | 76 | ... | ... | ... | ... | . . | 59,63 | ... | 66 | ... | 79 | ... | 5 |
| 22 | 71 | 72 | ... | ... | 76 | ... | ... | ... | ... | 61,65 | 68,70 | ... | 7 |
| 23 | 59 | 61 | 66,77 | 60,69 | ... | 74,78 | 72 | 65 | 72,75,79 | ... | 64 | 76 | 15 |
| 24 | ... | 65 | 65 | ... | 58 | 72,79 | 78 | 73 | 60,61 | 78 | ... | ... | 10 |
| 25 | 61 | ... | 68 | 59 | 74 | ... | 67 | 72,77 | ... | 59,72 | ... | 71 | 10 |
| 26 | 65 | 74 | ... | ... | ... | ... | ... | 59,63 | 59,68 | 64 | ... | 59,73 | 9 |
| 27 | 67 | ... | ... | 61 | ... | ... | 58,61,74 | ... | ... | 77 | 58,69 | ... | 8 |
| 28 | 69,78 | ... | 72,78 | 58,66,73 | 75,79 | ... | 60,66,68,69,76 | 66 | 62 | ... | 59,65,74 | 77 | 20 |
| 29 | ... | 68 | ... | 70 | 68 | 73 | ... | ... | 71 | 74 | ... | 60 | 7 |
| 30 | 58,62 | ... | 59,74 | 63 | ... | 66,75 | ... | ... | 74 | 63 | 67,72 | 79 | 12 |
| 31 | ... | ... | ... | ... | .. | ... | 65 | ... | ... | ... | ... | 65,68,78 | 4 |

which he had not seen it should prove that the instances of maximum falls have been more numerous on those dates than on any others, that




the collective instances between those dates are more numerous than in any other period of equal length, and that the total number of instances is 71 instead of 52, which would have been the number if heavy falls were of equally frequent occurrence at all dates in the month.

---

*To the Editor of the Meteorological Magazine.*

SIR,—My record for 30 years hardly bears out Mr. Scott's theory. You have it on the sheet enclosed, together with all the great falls (which you published two years ago*). Last week's fall was unprecedented (5 inches).—Yours faithfully, W. LUCAS.

*Hitchen, Sept. 20th,* 1880.

[As the list from 1852 to 1878, both inclusive, was given in the *Meteorological Magazine* for 1878 (Vol. XII., p. 106), we think it needless to print more than the falls since that date.—Ed.]

*Falls of* 1 *in. and above since August,* 1878 :—

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1879. | Jan. 1 | ..... | 1·00 in. | 1880. | Sept. 11 | ..... | 1·86 |
| ,, | Aug. 2 | ..... | 1·94 in. | ,, | ,, 14 | ..... | 1·47 |

*Greatest fall in* 24 *hours, between* 23*rd and* 28*th inclusive, since* 1849, *as follows* :—

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 4 | times in | 1850 | ..... | 5 | times in | 1861 | ..... | 2 | times in | 1872 |
| 5 | ,, | 51 | ..... | 0 | ,, | 62 | ..... | 3 | ,, | 73 |
| 2 | ,, | 52 | ..... | 3 | ,, | 63 | ..... | 4 | ,, | 74 |
| 5 | ,, | 53 | ..... | 4 | ,, | 64 | ..... | 3 | ,, | 75 |
| 4 | ,, | 54 | ..... | 2 | ,, | 65 | ..... | 2 | ,, | 76 |
| 1 | ,, | 55 | ..... | 1 | ,, | 66 | ..... | 3 | ,, | 77 |
| 2 | ,, | 56 | ..... | 2 | ,, | 67 | ..... | 6 | ,, | 78 |
| 3 | ,, | 57 | ..... | 2 | ,, | 68 | ..... | 3 | ,, | 79 |
| 2 | ,, | 58 | ..... | 3 | ,, | 69 | ..... | | | |
| 4 | ,, | 59 | ..... | 2 | ,, | 70 | ..... | — | | |
| 3 | ,, | 1860 | ..... | 1 | ,, | 1871 | ..... | 86 | times in | 30 years. |

* August, 1878.

*To the Editor of the Meteorological Magazine.*

SIR,—Noticing in two consecutive issues of your magazine letters on the above subject, I am tempted to trespass on your time and space, and send you a few figures relative to the rainfall in this locality.

My record was begun in April, 1870, but in the following table I have only included the nine complete years, 1871–1879.

This is only a short period, but still, as the subject is under discussion, the results for this part of the country may prove of interest to some of your readers.

I think I can guarantee the accuracy of my observations, and I may further state that the record is a complete one, no break having occurred since its commencement in 1870.

| | 1871. | 1872. | 1873. | 1874. | 1875. | 1876. | 1877. | 1878. | 1879. | Average date of max. fall. |
|---|---|---|---|---|---|---|---|---|---|---|
| January | 7 | 16 | 18 | 16 | 1 | 20 | 3 | 27 | 17 | 14th Jan. |
| February | 5 | 29 | 23 | 21 | 11 | 25 | 25 | 28 | 7 | 19th Feb. |
| March | 15 | 30 | 6 | 28 | 7 | 2 | 24 | 31 | 16 | 18th Mch. |
| April | 22 | 27 | 16 | 13 | 4 | 27 | 4 | 20 | 20 | 17th Apl. |
| May | 25 | 9 | 10 | 5 | 17 | 22 | 10 | 7 | 29 | 15th May |
| June | 22 | 18 | 29 | 30 | 10 | 21 | 21 | 8 | 7 | 18th June |
| July | 29 | 7 | 22 | 23 | 19 | 26 | 14 | 24 | 20 | 20th July |
| August | 24 | 10 | 4 | 27 | 10 | 28 | 20 | 13 | 5 | 16th Aug. |
| September | 27 | 1 | 9 | 30 | 19 | 24 | 2 | 22 | 11 | 16th Sept. |
| October | 6 | 7 | 2 | 6 | 20 | 8 | 12 | 24 | 24 | 12th Oct. |
| November | 14 | 4 | 1 | 28 | 13 | 28 | 30 | 9 | 24 | 17th Nov. |
| December | 30 | 16 | 19 | 6 | 31 | 30 | 30 | 25 | 9 | 22nd Dec. |
| Number of months in which the max. fall occurred between the 23rd and 28th of the month.. | 3 | 1 | 1 | 4 | None. | 6 | 2 | 5 | 2 | |
| Average date of max. fall for each month | 19th | 15th | 13th | 19th | 14th | 22nd | 16th | 20th | 16th | |

The above table shews the date of maximum fall in every month of the nine years, the average date for each month, the average date of the month for each year, and the number of months in each year when the maximum fall occurred between the 23rd and the 28th.

I find, from the above table, that our monthly maximum fall occurs, on the average, on the 17th.

I send these few remarks and figures in the hope that they may be of some service, and shall be glad to give any of your correspondents further details, as to the rainfall in this locality, in the event of the subject being more fully and thoroughly worked up.—Yours faithfully,

ARTHUR R. ANDERSSON.

*Breeze Hill, near Liverpool, Sept. 23rd,* 1880.

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*To the Editor of the Meteorological Magazine.*

SIR,—Your correspondents, Mr. Newnham and Mr. J. W. Scott, seem to be of opinion that the heaviest rainfall in each month usually

occurs towards the end, especially from the 23rd to the 28th inclusive. Now, although such may seem to be the case, judging from the records of a number of years past, I cannot but think that it is an accidental coincidence.

The calendar month is quite an arbitrary division of time, and does not correspond with any astronomical period. It is about 30·44 days on the average, whilst the lunar synodic month consists of 29·53 days, and the revolution of the sun on its axis, relatively to the earth, takes place in 27·3 days; and these seem the only astronomical periods, approaching the calendar month in length, that can possibly affect the weather.

The 25th January last was the fourteenth day of the moon, and the 25th of December will be the twenty-fourth of the moon.

The day of heaviest rainfall varies at different stations, therefore the returns from one or two places do not form a sufficient foundation on which to build a theory.

I may just add that the heaviest falls here, during the past eight years, have occurred twenty-three times, instead of twenty-eight times, on the days referred to.—Yours truly, S. KING.

*Elswick Lodge, Sept. 20th,* 1880.

[It may be well to extract the essential features from the above letters, so that our readers may understand precisely the evidence on both sides, for it seems to us that even our correspondents hardly realize the force of the evidence they supply. We will throw the facts into a table :—

| Div. | Station. | Years discussed. | Instances of **M** between 23rd and 28th. | | Instances in excess of probable No. | |
|---|---|---|---|---|---|---|
| | | | Probable. | Actual. | Number. | Per cent. |
| I. | Muswell Hill ..... | 8 | 19 | 28 | 9 | 47 |
| I. | Camden Square ..... | 22 | 52 | 71 | 19 | 37 |
| III. | Hitchen ..... | 30 | 71 | 86 | 15 | 21 |
| VIII. | Liverpool ..... | 9 | 21 | 24 | 3 | 14 |
| VIII. | ElswickLodge,Lancashire | 8 | 19 | 23 | 4 | 21 |

ED.]

## REMARKABLE HAILSTONES.

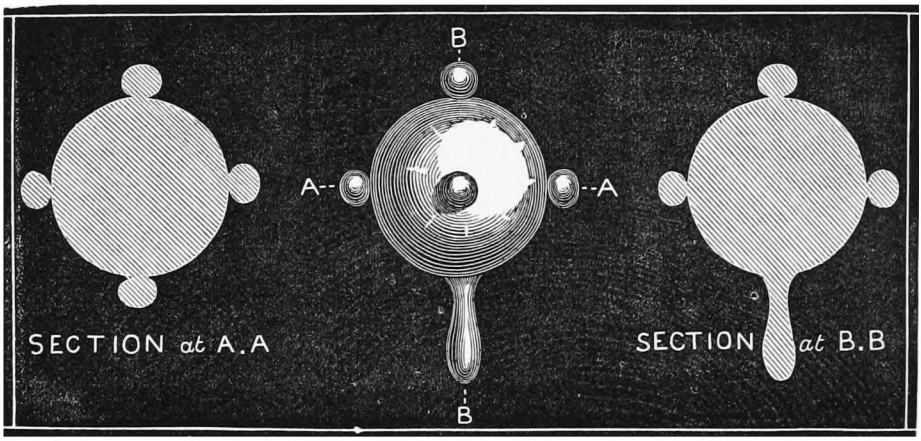
*To the Editor of the Meteorological Magazine.*

SIR,—During a slight thunderstorm at 6 p.m. on the 21st inst., there fell hailstones of a shape which I have never before seen. The day had been cloudless. I was on a mountain about 3000 feet above the village, and saw the cloud (a small one) pass over the valley below me. There were several peals of thunder but there was no visible lightning, owing, I conclude, to the sun's brightness.

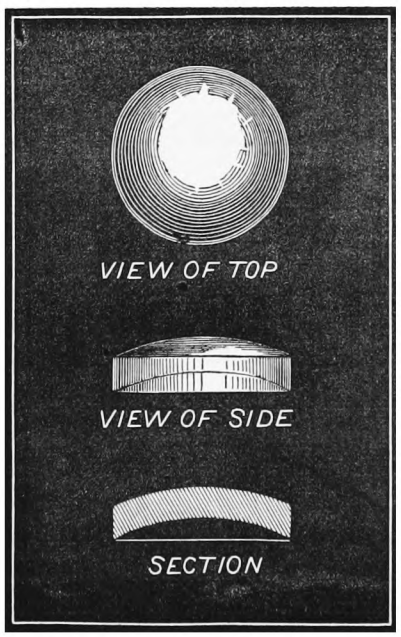
On arriving near home, I met a friend who told me it had been hailing "tadpoles" and "acidulated drops." There had been little or no rain and no visible lightning, and the hailstones fell at in-

tervals and about six feet apart. There were very few of them, my family only picking up 20 in a space occupied by a full-sized lawn tennis court.

My son made a sketch of their shape and size, which I enclose.




The greater part were of the "tadpole" shape and were clear as glass, perfectly round, the five knobs being at equal distance from one another. The flat stones had more or less a slight nucleus of snow in the convex portion of the stone.




Yesterday, in a severe storm in a gorge in the heart of the Zugspitz, a quantity of hail, with torrents of rain, fell. They were small, and apparently round, but, looked at sideways, they were

hexagonal with rays to centre. Several "cones" also fell, looking, from their shape and size, as if they had formed part of one hail-stone.—Truly yours, MICHAEL FOSTER WARD.

*Partenkirchen, Bavaria, 27th August*, 1880.

[On receipt of this letter we wrote and asked Col. Ward a few questions, to which he kindly replied as follows.—ED.] :—

*To the Editor of the Meteorological Magazine.*

SIR,—Yours just received, and I lose no time in replying as far as I can to your queries. My son, who made the sketch and carefully examined the stones, is now at Sandhurst, and I have written to him telling him also to write to you.

My wife and three daughters, and two ladies staying with us, say that the stones looked just like a lady's hand looking glass, with a knob at the top and on either side for ornament.

More than 20, perhaps 30, were picked up of this shape. Of these about two-thirds were studded, the rest plain, with only the tail or handle, the thinnest part of it being near the body of the stone, as in sketch.

The studs were all symmetrically placed. I have carefully questioned my wife and girls on this point, and they say that they *remarked particularly* the fact of their *being* so *equi-distant* one from the other.

There were from three to five in each stone besides the handle. When there were less than five they occupied the same positions as if the five had been complete. In some cases the handle appeared to have been knocked off.

The drops were more numerous, were *all* of same shape, convex at the top, the bottom being concave (like a small china painting palette).

I wish I had seen the stones myself—not that there is the slightest doubt of their being as described. They were seen not only by my family and the friends with us, but by other people who were with them that afternoon, and whom I met on my way home, and who described them to me exactly as my family did. They ate a quantity of them, holding them by the handles to do so.

My daughters say that my son examined them most carefully, being so extraordinary in shape and knowing that I was observing for Prof. Colladon, of Geneva, who is studying the subject, and has asked me to watch carefully every hailstone I can, and send him a description of size, shape, and formation. I have not yet heard from the Professor, his time being so much taken up with the St. Gothard tunnel that he has little for aught else.

The cloud from which these curious hailstones fell, though appearing to us on the mountain as quite low down below us, appeared to those in the valley as at a considerable height; so I fancy it was not of very great thickness.—Sincerely yours,

MICHAEL FOSTER WARD,

*Villa Fraundorfer, Partenkirchen, 14th Sept.* 1880.

My eldest girl has just come in and read this. She says it is strictly accurate, and that *her* first remark on seeing the stones was, "They are just like a clown's head, with his tuft at the top and each side."

*To the Editor of the Meteorological Magazine.*

SIR,—My father has just written to tell me that you wish for a description of the hailstones found on August 21st.

They were of the shape and size shewn in the sketch, and of those we picked up, more than twenty in number, nearly all had the five studs complete. In some cases one or two were wanting, but in these there was an irregularity in the surface of the larger sphere at the places occupied, in the more complete specimens, by the studs, as if they had been either melted or knocked off.

The studs were all symmetrically placed, a round one being opposite to the longer handle-shaped stud, and the four others arranged at equal distances round the sphere at AA′, which is at right angles to the section BB′. There were thus five apparently spherical balls, and one oblong stud.

With regard to those shaped like acid drops, one side was convex, and the other concave. The curve of the sides was about that of a circle of two inches diameter.

In some instances I remarked that the latter were slightly opaque in the centre, but round the edges clear.—I remain, Sir, yours truly, RAWDON WARD.

*Royal Military College, Sandhurst, Hants, Sept. 17th,* 1880.

## THE BRITISH ASSOCIATION AT SWANSEA.

*(Concluded from page* 117.*)*

### REPORT OF THE COMMITTEE ON UNDERGROUND TEMPERATURE.

This report, prepared and read by Prof. Everett, proceeds on much the same lines as those of the twelve previous years. A fresh series of observations has been started at Lead Mines in North Wales, through the co-operation of Mr. Walker, but the results seem to be rendered irregular by the presence of decomposing iron pyrites. The report gives also data recently obtained from the Astley Pit at Dukinfield, which has now reached the great depth of 2,700 feet.

### ON THE TEMPERATURE OF TOWN WATER SUPPLIES.

By BALDWIN LATHAM, C.E.

This was a sequal to the paper read upon the same subject last year. The author shows conclusively that the temperature of the water when delivered is entirely regulated by that of the soil through which the mains are laid. And as there seems evidence that the supply of drinking water at a high temperature is not so healthful as at a low one, he urges that water mains should be laid at such a depth as to escape great extremes of temperature. The observations of earth temperature which have of late years become general will supply data of importance in this respect.

## ON THE LAWS OF CHANGE OF VELOCITY AND DIRECTION OF WIND.

By Prof. D. Ragona.

No abstract of this paper has reached us.

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## THE SANITARY INSTITUTE.

### EXETER CONGRESS.

This young but rising Institute has held a most successful autumn meeting at Exeter; the local authorities equally by their energy and by their liberality not only deserved success but obtained it, and while the Institute ought to be thankful for the handsome hospitality and constant encouragement rendered by the Right Worshipful Mayor (Mr. W. Horton Ellis, F.M.S.,) and by the Lord Bishop, the city may remember with satisfaction that it had for its guests a large proportion of the very highest authorities in the country upon sanitary matters. We cannot afford space to quote many, but may take a few, grouping them under the three sections into which the work of the Congress is divided.

First, however, we must take the President (Earl Fortescue), himself a well-known veteran in sanitary matters, and with his name we may couple those of the Bishop (Dr. Temple), Sir Stafford Northcote, and Mr. H. S. Northcote, M.P.

The section for State Medicine could hardly have a better president than Prof. De Chaumont, the head of the Government establishment at Netley, supported by Dr. Richardson, F.R.S., Mr. Edwin Chadwick, C.B., and Prof. Corfield.

The president of the section for Engineering was Mr. R. Rawlinson, C.B., C.E., chief engineering inspector to the Local Government Board, and he was supported by several members of the Institution of Civil Engineers, who have given much attention to sanitary matters, *e.g.*, Mr. Rogers Field, Mr. R. B. Grantham, Mr. Boulnois, and Major-General Scott, C.B., F.R.S.

The third section, Meteorology and Geology, was presided over by Sir Antonio Brady, F.G.S., one of the Trustees of the Meteorological Society, and among his supporters (besides some already mentioned) were Mr. T. Andrew, F.G.S., Mr. W. Pengelly, F.R.S., F.G.S., Mr. G. J. Symons, F.R.S., Pres. M.S., Mr. E. E. Glyde, F.M.S., &c.

It would be running beyond our tether to quote all the paragraphs touching upon meteorology, and even with Sir Antonio Brady's address we are obliged to deal harshly. It would more than fill the whole of this number of the *Meteorological Magazine.* But the Institute publishes its Transactions at a very low price, and it is intended that the volume shall be ready within a month (what a lesson to the British Association if it is ?) and therefore we leave our readers to obtain it *in extenso.*

We must, however, state briefly that the general scope of the address was a sketch of the physical history of the globe from its

first existence as a cooling nebulous mass, tracing it through varied geological and climatological conditions until man came upon it, and more or less spoilt it—dessicating some countries by ruthless destruction of forests, poisoning rivers with sewage, the air with coal smoke, and in sundry other ways changing the natural condition of things, and "paying the penalty for so doing."

Sir Antonio Brady went at great length into the injurious effects of cutting down forests, and also into the doubts thrown upon the advantage of the millions of money expended upon irrigation works in India. We trust that these parts of his address will be carefully studied, and we are sure that he will join us in hoping that the alarming statements which he quoted from Col. Corbett as to the injury wrought by irrigation works will be entirely refuted.

The following is the only strictly meteorological paper read at the Congress.

## SOME DEFICIENCIES IN OUR KNOWLEDGE RESPECTING HEALTH RESORTS.

By G. J. SYMONS, F.R.S., *President of the Meteorological Society.*

THE remarks which I have to offer upon the present occasion differ materially in their character from those which are assumed to usually form the basis of those submitted to scientific bodies.

As a rule, an author reads a paper in order to bring before his audience, and perhaps still more before that far larger audience which he addresses through the press, something which he believes to be new, something which he hopes will make the world wiser and better than it would be without it.

I am aware that there are persons who read papers with the sole desire to see their names in print, and others who do so in order to puff the commodities in which they deal—but they are beneath notice.

Well, then, the usual object of a paper is to afford information. But mine is to obtain it, and although perhaps I shall give a little in the mere explanation of what I want, still I hope that the balance will eventually be largely in my favour, and that is why the title of this paper does not promise any information at all.

It has lately been said, and I think with truth, that whereas in past years the Autumn holiday was a *luxury*, it has, through the increasing exhaustion due to modern high pressure life, become a *necessity*.

Assuming that to be true, it is obviously of increasing importance that the localities to which we temporarily migrate should be as healthy as they can be made.

And here it may be well to remark that the visitors are better judges of what is healthy than the residents. Those who spend the whole twelvemonth on a bracing mountain slope cannot realize that it matters whether the bedroom windows open at the top or not; and, as sleeping in a close room does not affect them, they set any remonstrance down as a whim of their visitors, forgetting that it is the constant breathing of a pure atmosphere during the day and all through the year which enables them to sleep in a used-up atmosphere with impunity—and equally forgetting that it is largely for the sake of pure air that their visitors come, that where they get most pure air they will derive most benefit, and will therefore be most likely to return.

I have quoted only one feature—windows; but need hardly say that identical reasoning applies to cleanliness in every respect—to purity of water, to the quality and cooking of food, and, indeed, to all the ministrations of life.

This digression has taken me far away from the subject I wish to bring before you. I must return abruptly, and try to keep closer to it.

I am far from denying that, in spite of the very unsanitary—and to our

notions, offensive—arrangements existing at many places on the Continent, it is often better for persons to go to a continental health resort than to stop in the United Kingdom, because the change of air, scene, habit, and language, is more thorough. Yet, I believe, it would be far better to bestow more attention on our own health resorts than we do.

*(To be continued.)*

## SUPPLEMENTARY TABLE OF RAINFALL IN SEPT., 1880.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 5·90 | XI. | Corwen, Rhug ..... | 2·82 |
| ,, | Margate, Acol ..... | 2·94 | ,, | Port Madoc ..... | 5·30 |
| ,, | Littlehampton ..... | 5·14 | ,, | Douglas..... | 4·44 |
| ,, | St. Leonards ..... | 3·91 | XII. | Carsphairn ... ..... | 4·61 |
| ,, | Hailsham ..... | 2·43 | ,, | Melrose, Abbey Gate... | 3·99 |
| ,, | I. of W., St. Lawrence. | 5·25 | XIV. | Glasgow, Queen's Park. | ... |
| ,, | Alton, Ashdell..... | 6·07 | XV. | Islay, Gruinart School.. | 3·63 |
| III. | Great Missenden..... | 5·41 | XVI. | Cupar, Kemback..... | 3·56 |
| ,, | Winslow, Addington ... | 4·08 | ,, | Aberfeldy H.R.S. ..... | 1·32 |
| ,, | Oxford, Magdalen Col... | 3·67 | XVII. | Tomintoul..... | ... |
| ,, | Northampton ..... | 4·65 | ,, | Keith H.R.S. ..... ..... | 1·72 |
| ,, | Cambridge, Merton Vil. | 2·85 | ,, | Forres H.R.S. ..... ... | 1·21 |
| IV. | Harlow, Sheering ..... | 4·54 | XVIII. | Strome Ferry H.R.S.... | 4·42 |
| ,, | Diss ..... | 2·58 | ,, | Auchnasheen H.R.S. ... | ... |
| ,, | Swaffham ..... | 3·86 | ,, | Lochbroom ..... | 2·12 |
| ,, | Hindringham ..... | 3·35 | ,, | Tain, Springfield..... | 1·86 |
| V. | Salisbury, Alderbury... | 3·57 | ,, | Loch Shiel, Glenfinnan. | 7·95 |
| ,, | Calne, Compton Bassett | 4·05 | ,, | Dalwhinnie H.R.S..... | ... |
| ,, | Beaminster Vicarage ... | 5·91 | XIX. | Lairg H.R.S. ..... | ... |
| ,, | Dartmoor, Princetown.. | ... | ,, | Altnabreac H.R.S. ..... | 3·06 |
| ,, | Langtree Wick ..... | 3·63 | ,, | Watten H.R.S. ..... | 3·63 |
| ,, | Lynmouth, Glenthorne. | 2·40 | XX. | Fermoy, Glenville ..... | 2·61 |
| ,, | St. Austell, Cosgarne... | 3·80 | ,, | Tralee, Castlemorris ... | 2·61 |
| ,, | Taunton ..... | 3·00 | ,, | Cahir, Tubrid ..... | 2·30 |
| VI. | Bristol, Ashleydown ... | 3·93 | ,, | Tipperary, Henry St.... | 2·84 |
| ,, | Ross ..... | 3·62 | ,, | Newcastle West ..... | ... |
| ,, | Wem, Sansaw Hall..... | 1·75 | ,, | Kilrush ..... | 2·98 |
| ,, | Cheadle, The Heath Ho. | 3·41 | ,, | Corofin ..... | 3·34 |
| ,, | Bickenhill Vicarage .. | 5·54 | XXI. | Kilkenny, Butler House | ... |
| VII. | Melton, Coston ..... | 4·50 | ,, | Carlow, Browne's Hill.. | 2·79 |
| ,, | Horncastle, Bucknall ... | 3·78 | ,, | Kilsallaghan..... | 2·26 |
| VIII. | Walton-on-the-Hill..... | 3·01 | ,, | Navan, Balrath ..... | 1·98 |
| ,, | Broughton-in-Furness .. | 5·33 | ,, | Athlone, Twyford ..... | 2·66 |
| IX. | Wakefield, Stanley Vic. | 4·72 | ,, | Mullingar, Belvedere ... | 2·60 |
| ,, | Ripon, Mickley ..... | 4·40 | XXII. | Ballinasloe ..... | 2·17 |
| ,, | Scarborough..... | 3·50 | ,, | Clifden, Kylemore ..... | 5·02 |
| X. | Mickleton..... | 4·06 | ,, | Crossmolina, Enniscoe.. | 3·49 |
| ,, | Haltwhistle, Unthank.. | 4·98 | ,, | Carrick-on-Shannon ... | 2·72 |
| ,, | Shap, Copy Hill ..... | 4·57 | XXIII. | Dowra ..... | 2·89 |
| XI. | Llanfrechfa Grange . ... | 4·06 | ,, | Rockcorry..... | 3·03 |
| ,, | Llandovery ..... | 3·03 | ,, | Warrenpoint ..... | 4·21 |
| ,, | Solva..... | 2·01 | ,, | Newtownards ..... | 3·07 |
| ,, | Castle Malgwyn ..... | 4·56 | ,, | Carnlough..... | 3·27 |
| ,, | Rhayader, Nantgwillt.. | 4·92 | ,, | Bushmills ..... ..... | 3·29 |
| ,, | Carno, Tybritle ... ..... | 2·90 | ,, | Buncrana ..... | 3·14 |

## THE WEATHER IN SEPTEMBER.

Real "summer weather" prevailed over Great Britain during the first week; but in Ireland and western Scotland it was rather less settled than elsewhere, and there were a few slight showers. Lightning was seen in many places during the latter part of the week, thunder accompanying it in some cases.

Barometric pressure varied considerably, owing to the advance of several depressions from the Atlantic, namely, on the 2nd, 3rd, and two during the night 5th–6th—one to the N.W. of Scotland, the other accross the Bay of Biscay, towards our S.W. coasts. When the last of these had passed away, the bar. rose over the whole of our islands, and gradients for W. and N.W. breezes became general.

Temp. was above the average throughout our islands. In S. and S.W. England the excess was 4°, but in nearly all other parts as much as 6° or 7°. The highest temperature of the present year was recorded, namely, 88° at Nottingham and Cambridge, 87° at Loughborough and in London, all on the 4th. The nights were generally mild; but during those of the 1st and 6th a min. of between 43° and 47° was registered in the inland districts.

Rainfall below the mean. in all parts, the deficit being as great as 0·95 in. at Barnstaple. The smallest deficit was 0·01 in. at Cambridge.

Bright sunshine, except in S. Ireland, shewed a decided increase. Max. duration 64 hours at York, and 60 hours at Geldeston (Norfolk); min. duration, 28 hours at Valentia.

During the 7th and following night the bar. rose very briskly in N. Ireland, in Scotland, and in the W. of Norway, an anticyclone being formed over the N. of our islands. In France, and in the S.W. and S. of these Isles, however, pressure decreased somewhat, owing to the arrival of a depression over the Bay of Biscay. The charts of the next morning shewed that this had moved N. wards till it was over the Scilly Islands, while the anticyclone in the N. had widened out till it occupied the E. coast of Great Britain as far S. as Shields, S. and S.W. Norway, a large part of Denmark, and the sea intervening. The bar. consequently fell in the W. and N.W., but rose quickly over Scandinavia. Both the fall and the rise continued during the next 24 hours, so that readings, on the morning of 10th, varied from 30·2 in. over Sweden to 29·4 in. off our extreme N.W. coast, near to which latter district a large area of low pressure was moving N.E. ward. A small secondary disturbance moved across Ireland on the afternoon of the 10th, and was over Devon, Dorset, and Gloucestershire on the following morning. Both this secondary, and the large disturbance, disappeared during the 11th; but a third came across the W. of France during the latter part of the 11th, and at 8 a.m. on the 12th was shewn off the English E. coast, the weather being very unsettled. A brisk decrease of pressure began in the W. on the evening of the 13th, and the charts of the 14th shewed that a small but deep depression had arrived in the neighbourhood of Valentia, where the bar. fell 0·80 in. in 24 hours.

Temp. rather above the mean, except in E. and central England, and N. Ireland, where it was about the average. The max. took place on the 10th, 80° in London, and 79° at Nottingham being the highest. The min. were rather low, the ther. falling to 37° at Shrewsbury, and 38° at Churchstoke and Markree Castle. At Silloth the ther. on the grass fell to 30° on the early morning of the 8th.

Rainfall above the average, except in W. Scotland. The excess was as much as 1·87 inch at Strathfield Turgiss, 1·77 at Loughborough, and 1·71 at Rothamsted. At Glasgow and Ardrossan the deficit from the mean was nearly half-an-inch.

Bright sunshine decreased, except in Ireland. Max. duration: 54 hours at Geldeston, 51 hours at Douglas. Min. duration: 24 hours at Falmouth, 27 hours at Cirencester.

The depression noticed as near Valentia on the morning of the 14th, travelled

during the day in a S.E. direction to Cornwall: during the night (14th–15th), however, it changed its course, and moving E.N.E. was at 8 a.m. on the 15th near Lowestoft. After moving irregularly during the 14th, it travelled north-eastwards to Denmark during the 16th and night following; but a new and larger depression appeared off the N.W. of Scotland, producing a decrease of pressure over Scotland and Ireland. This area of low pressure came to a halt on its arrival off the Scotch coast, while subsidiary disturbances passed across the more southern districts, keeping the weather very unsettled. All these disappeared E. wards during the 19th, causing a fall of the bar. over the whole of the countries to the E. of the North Sea; in these islands and the W. of France pressure increased briskly, and the area of high readings which, on the 19th, lay over the S. of France, spread northwards towards the S.W. coasts of these Islands. During the next 24 hours the bar. rose slightly over England and France; but fell in the far N.; the distribution of pressure remaining, however, much the same.

Temp. a few degrees less than the average in all parts. The max. were all very low, 69° at Loughborough on the 16th, being the highest. The min. were generally 39° and 40°. A frost on the grass occurred in London early on the 20th; but the min. in the shade did not fall below 41°.

Rainfall above the mean everywhere, except at Nairn, the excess being considerable over the greater portion of England and in W. Scotland. Heaviest falls: 3·44 inches at Rothamsted, 3·22 at Southampton, 3·11 at Kelstern, 3·02 at Douglas, and 3 inches at Leicester. Lightest fall: 0·23 at Nairn.

Bright sunshine prevailed during less hours than in the week preceding. Max. duration: 43 hours at Douglas; min. duration: 18 hours at Llandudno.

The weather during the week, 21st–27th, was dry in all districts: the sky was, however, very cloudy or overcast, and on some days there was fog or haze.

Under "barometer" there is little to remark. Pressure continued to be highest in the S., and lowest in the N.; but the passage across our islands of several subsidiary disturbances, during the 21st and day following, made the gradients for S.W. and W. irregular, and the wind rather variable. During the 25th, pressure increased everywhere, except on our extreme N.W. coasts, and a large area of comparatively high readings covered France, all the more southern parts of our islands, the larger portion of the North Sea, and Scandinavia. Next day pressure increased over all W. Europe; but a depression, which was shewn off the N.W. coast of Norway on the charts of the 27th, moving E. wards during the day, produced a fall of the bar. over Scandinavia, while it rose in our Isles and France, so that the area of high pressure now occupied the whole of these islands, N. Germany, and N. France.

Temp. slightly more than the mean. The max. took place mostly on 27th, when a reading of 75° in London was recorded. The absolute min. was only 39° (at Glenalmond, on 21st and 22nd).

Rainfall a good deal below the average, except at Durham and Silloth. Heaviest falls, 0·99 in. at Laudale and Silloth; lightest falls, 0·01 in. at Cirencester.

Bright sunshine was everywhere of very short duration. Max. duration, 27 hours, at Aberdeen; min. duration, 6 hours, at Cirencester.

The depression, which was over Scandinavia on the 27th, moved off on the next day, and pressure increased somewhat there; but during the 29th a new disturbance advanced to the N. of Scandinavia, occasioning a rapid fall of the bar.. over Scandinavia. Over these islands, and the N. of France, the anti-cyclone maintained its position. The depression disappeared during the 30th, and the bar. rose over Norway and Sweden; but in these islands and France pressure decreased, the anticyclone hence being shifted a little more to the south-east.

*Lowestoft.* H. E. M.

# SEPTEMBER, 1880.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1860–5 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date. | Min. Deg. | Date. | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | Camden Square | 4·04 | + 1·78 | 1·33 | 11 | 12 | 88·3 | 4 | 42·1 | 20 | 0 | 0 |
| II. | | Maidstone (Hunton Court) | 3·07 | + ·95 | .95 | 14 | 13 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss | 4·57 | ... | 1·58 | 11 | 14 | 85·0 | 4 | 41·4 | 20 | 0 | 0 |
| III. | | Hitchen | 5·06 | + 3·20 | 1·86 | 11 | 14 | 77·0 | 4 | 42·0 | 18 | 0 | ... |
| ,, | | Banbury | 5·08 | + 2·71 | 1·52 | 12 | 18 | 82·5 | 4 | 43·0 | 19 | 0 | ... |
| IV. | | Bury St. Edmunds (Culford) | 4·52 | + 2·91 | 1·75 | 11 | 12 | 82·0 | 4 | 41·0 | 7* | 0 | ... |
| ,, | | Norwich (Cossey) | 2·24 | + ·45 | ·75 | 14 | 13 | 85·0 | 4 | 43·5 | 8,19 | 0 | ... |
| V. | | Bridport | 4·05 | + 1·73 | 1·10 | 13 | 13 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple | 4·07 | + ·31 | ·98 | 15 | 15 | ... | ... | ... | ... | ... | ... |
| ,, | | Bodmin | 4·18 | + ·51 | ·76 | 18 | 19 | 76·0 | 4 | 47·0 | 7 | 0 | 0 |
| VI. | | Cirencester | 4·29 | + 1·43 | ·86 | 13 | 12 | ... | ... | ... | ... | ... | ... |
| ,, | | Shifnal (Haughton Hall) | 3·53 | + 1·58 | ·90 | 15 | 18 | 80·0 | 4 | 40·0 | 19 | 0 | 0 |
| ,, | | Tenbury (Orleton) | 3·45 | + ·77 | ·88 | 14 | 15 | 84·8 | 4 | 38·3 | 20 | 0 | 0 |
| VII. | | Leicester (Town Museum) | 5·28 | ... | 1·39 | 14 | 18 | 84·4 | 4 | 43·0 | 8 | 0 | 0 |
| ,, | | Boston | 4·91 | + 3·34 | 1·58 | 15 | 12 | 88·0 | 4 | 43·0 | 19 | 0 | ... |
| ,, | | Grimsby (Killingholme) | 4·86 | ... | 1·73 | 11 | 13 | 77·0 | 3 | 43·0 | 20 | 0 | ... |
| ,, | | Mansfield | 4·64 | ... | 1·19 | 15 | 13 | 75·5 | 4 | 41·8 | 8 | 0 | 0 |
| VIII. | | Manchester (Ardwick) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| IX. | | York | 4·57 | + 2·24 | 1·32 | 11 | 14 | 89·0 | 4 | 43·0 | 20 | 0 | 1 |
| ,, | | Skipton (Arncliffe) | 6·25 | + 1·29 | 1·06 | 15 | 20 | 79·0 | 3,4 | 40·0 | 19 | 0 | ... |
| X. | | North Shields | 4·34 | + 2·64 | 1·02 | 14 | 17 | 72·2 | 4 | 40·0 | 20 | 0 | 0 |
| ,, | | Borrowdale (Seathwaite) | 9·51 | — 3·70 | 1·21 | 10 | 19 | ... | ... | ... | ... | .. | ... |
| XI. | WALES. | Cardiff | 3·67 | ... | ·77 | 17 | 15 | 81·6 | 4 | 44·8 | 20 | 0 | 0 |
| ,, | | Haverfordwest | 3·83 | + ·12 | ·63 | 14 | 16 | 78·0 | 4 | 43·0 | 28 | 0 | ... |
| ,, | | Aberdovey | 1·26 | ... | ·21 | 12 | 14 | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno | 2·16 | — ·18 | ·40 | 22 | 16 | 81·8 | 4 | 47·0 | 19 | 0 | ... |
| XII. | | Cargen | 3·24 | — ·22 | ·78 | 10 | 16 | 80·4 | 4 | 40·2 | 20 | 0 | ... |
| ,, | | Hawick (Silverbut Hall) | 4·24 | ... | 1·63 | 14 | 15 | ... | ... | ... | ... | ... | ... |
| XIV. | | Douglas Castle (Newmains) | 4·02 | ... | ·88 | 14 | 17 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Long (Arddaroch) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Kilmory | 3·72 | ... | ·79 | 10 | 18 | ... | ... | 35·0 | 20 | 0 | ... |
| ,, | | Mull (Quinish) | 5·26 | ... | 1·50 | 10 | 19 | .. | ... | ... | ... | ... | ... |
| ,, | | Loch Leven | 2·70 | — ·33 | 1·00 | 16 | ... | ... | ... | ... | ... | ... | ... |
| XVII. | SCOTLAND. | Arbroath | 3·34 | + ·82 | 1·09 | 14 | 11 | 74·0 | 3 | 41·0 | 20† | 0 | ... |
| ,, | | Braemar | 2·69 | + ·05 | ·83 | 10 | 16 | 74·3 | 4 | 32·3 | 19 | 0 | 5 |
| XVIII | | Aberdeen | 3·27 | ... | ·86 | 10 | 14 | 77·0 | 3,5 | 37·0 | 18 | 0 | ... |
| ,, | | Portree | 5·22 | — 5·54 | ·65 | 10 | 22 | ... | ... | ... | ... | ... | ... |
| ,, | | Inverness (Culloden) | 1·46 | — 1·23 | ·28 | 24 | ... | 77·1 | 4 | 37·9 | 19 | 0 | 1 |
| XIX. | | Dunrobin | ... | ... | ... | ... | ... | ... | ... | ... | ... | .. | ... |
| ,, | | Sandwick | 4·16 | + ·50 | ·86 | 30 | 21 | 70·0 | 4 | 45·3 | 19‡ | 0 | 0 |
| XX. | | Cork (Blackrock) | 1·96 | ... | 1·05 | 13 | 17 | 82·0 | 2 | 41·0 | 12 | 0 | ... |
| ,, | | Darrynane Abbey | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Waterford | 2·94 | — ·19 | 1·33 | 13 | 15 | 74·0 | 4 | 39·0 | 20 | 0 | 0 |
| ,, | | Killaloe | 2·95 | — 1·21 | ·69 | 17 | 19 | 85·0 | 2 | 40·0 | 20 | 0 | ... |
| XXI. | IRELAND. | Portarlington | 2·31 | — ·97 | ·45 | 17 | 22 | 79·0 | 4 | 42·0 | 12 | 0 | ... |
| ,, | | Monkstown | 2·90 | + ·91 | ·74 | 14 | 15 | .. | ... | ... | ... | ... | ... |
| XXII. | | Galway | 2·67 | ... | ·53 | 20 | 15 | 75·0 | 5 | 40·0 | 19 | 0 | ... |
| XXIII | | Waringstown | 3·46 | ... | ·99 | 17 | 15 | 77·0 | 3 | 41·0 | 18 | 0 | ... |
| ,, | | Londonderry | 2·53 | ... | ·56 | 21 | 19 | 78·0 | 4 | 45·0 | 8§ | 0 | 0 |
| ,, | | Edenfel (Omagh) | 2·99 | ... | ·49 | 17 | 20 | 79·0 | 4 | 34·0 | 7 | 0 | ... |

* And 16, 20. † And 21. ‡ And 20, 24. § And 19, 28.

+ Shows that the fall was above the average; — that it was below it.

# METEOROLOGICAL NOTES ON SEPTEMBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—Rainfall of the month 1·57 in. above the average of the last 14 years. Last week of month fine, warm, and genial; at intervals like a St. Martin's summer. Root crops excellent.

HITCHEN.—Mean temp. very high. From 11th to 17th inclusive the largest amount of rainfall recorded in one week during the last 30 years.

BANBURY.—White corn almost all harvested by end of month.

CULFORD.—The dry weather of August continued for a few days of this month, and vegetation began to show signs of distress, but on the 5th the bar. began to fall, and there was slight rain next day; on the evening of the 10th a severe tempest occurred, lasting four hours; the L was very intense, and 1·75in. of rain fell in six hours. The month ended with fine and enjoyable weather.

COSSEY.—Harvest was generally over in this district before the rain set in on the 11th, after a rainless period of 15 days. TS on 11th, and T on 18th and 19th.

BODMIN.—Mean temperature of the month 60°·1.

CIRENCESTER.—Much heavy rain in the middle of the month. Wind principally S.W.

SHIFNAL.—Rain fell daily in considerable quantities from the 9th to the 24th. The max. temp., 80° on the 4th, was the highest recorded during the year, but the temp. soon returned to its former moderate condition. After the 23rd fogs or mists occurred most mornings, often turning into bright sunshine, but there was no wind to dry the grain still unstacked. T on 14th.

ORLETON.—A remarkably fine month, with a mean temp. more than 2°·5 above the average. The first eight days were dry and fequently very hot; on the 4th the ther. rose to 84°·8, the highest temp. recorded in September during the last 50 years excepting September, 1868. On the 9th rain set in and continued every day till 18th; the remainder of the month was dry and warm, the mornings being foggy at the end. The bar. was generally high and steady, and the wind moderate, except on the 16th. TS on 14th, T on 18th. Grain-crops secured in good condition.

BOSTON.—Rainfall from 11th to 15th, the heaviest ever known in this district, 4·28 in. having fallen in 4 days; the result being one of the heaviest floods that has been known for many years, and, coming before the harvest was completed, not only soaked into the stacks already made, but in many cases rose so high on the land as to float the sheaves of corn.

KILLINGHOLME.—Fine summer weather at the commencement and close of the month, but from the 10th to the 19th great rains. L and T on 14th, 18th, and 19th.

YORK.—The opening days of the month were remarkably hot, the max. temp. ranging from 74° to 89°; the end was fine, but the middle 10 days very wet. TSS on 4th, 16th, and 18th; sheet L on 15th and 19th; frost on ground on 17th; fogs on 27th, 28th, and 29th.

## WALES.

HAVERFORDWEST.—The great heat of August and the fine character of the season continued up to the 6th; a period of broken wet weather set in on the 8th and continued till the 25th. From the 13th to the 16th was a very stormy period, the wind reaching the force of a full gale on the night of the 14th. The last week of the month was splendidly fine and genial. Harvest well saved; magnificent green crops.

LLANDUDNO.—Month rather showery, though the aggregate fall was rather below the average. The weather on the whole was genial, the mean temp. being 1°·5 above the average. Potatoes much diseased.

## SCOTLAND.

HAWICK.—The month was, on the whole, one of the mildest Septembers ever known here. Cereals have been got into the stack-yard in grand order.

BRAEMAR.—A fine harvest month. The crops all of best quality, and well secured.

ABERDEEN.—Heavy R occurred from the 10th to the 15th inclusive, but the beginning and end of the month were fine. Prevailing winds S. to S.W. Rainfall somewhat above the average.

CULLODEN.—The weather during the month was particularly fine. The temp. was high on many days, the max. on the 4th (77°·1) being the highest recorded during the year. Finer harvest weather has not occurred in this month since 1846.

SANDWICK.—The weather was generally fine till the last two days. Mean temp. 2°·6 above the average of 53 years. The reaping of a luxuriant crop was finished by the end of the month, *i.e.*, about the same date as it was begun last year.

## IRELAND.

KILLALOE.—A very fine harvest month with sufficient R, but not too much. Some very sultry days, and temp. high and equable throughout.

MONKSTOWN.—The early part of the month was extremely fine and hot; cooler weather with considerable R prevailed in the middle, and the end was also very fine but not so hot.

WARINGSTOWN.—Very fine and warm; considerable rainfall in the middle of the month, but on the whole very favourable.

LONDONDERRY.—Weather generally mild during the month; root crops well forward; harvest mostly secured.

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## HAILSTORM AT ROCHEFORT & SAINT-JEAN D'ANGELY.

"A correspondent of *La Nature* says that during the storm on August 20th, two hailstones, weighing as much as 500 (1 lb. 1½ oz.) and 490 grammes (1 lb. 1 oz.) respectively, were picked up. Another found stones weighing 220 grammes (7½ oz.) several minutes after their fall. A proprietor near Echilais had nine geese and twenty-eight fowls killed; hare, and game of all sorts were found dead; a very young foal was killed; two children were severely injured; an officer lost consciousness through the shock of a hailstone which struck him in the eye. The conformation of most of the hailstones was peculiar. The nucleus (they nearly all had one) was generally opaque, and formed of small compact masses, giving it the aspect of a raspberry. The rest of the mass was transparent, and opaque bands, following a pretty long spiral, appeared to form by a very powerful gyratory movement, opaque radial lines. [?] The crust consisted of small agglomerated pieces of ice, without determinate crystalline form. In some hailstones the nucleus was placed eccentrically."—*English Mechanic*, Oct. 1, 1880.

# SYMONS'S

## MONTHLY

# METEOROLOGICAL MAGAZINE.

CLXXVIII.] NOVEMBER, 1880. [PRICE FOURPENCE. *or 5s. per ann. post free.*


## EARLY SNOW.

The fall of snow which occurred over most of Southern England on October 19th, was so heavy and so early as to have attracted considerable attention. I gave in the *Times* of Oct. 21st, details of the earliest date of snow in 25 winters, 1806-31, from Howard's Observations, and in 23 winters, 1858-80, from my own.

The most important items in those two tables, including every entry of snow as early as Oct. 20th, are as follows :—

1806–31
- 1819. Oct. 21.—A sharp fall of snow in afternoon, and a heavy one at night.
- 1825. Oct. 20.—A little snow at 4 p.m.
- 1829. Oct. 7.—A considerable fall of snow between 1 and 3 p.m.

1859–80
- 1859. Oct. 22.—Snow in afternoon, but total fall less than a tenth of an inch.
- 1880. Oct. 19.—Snow began just before midnight, and continued till noon of 20th. Total depth probably 4 or 5 in. Greatest depth lying on ground, under 2 in.

It will be seen that there is an interval of twenty-eight years between these two sets of observations. Miss Ormerod's recently published *Cobham Journals* enables us to supply very nearly all the missing years. The following are all the notices in it of snow, on any date in October, between 1832 and 1850 :—

1836. Oct. 29.—Snow 2 in. deep, remaining on the ground for five days.
1838. Oct. 13.—Snow.
1842. Oct. 26.—Snow.
1848. Oct. 18.—Snow.

I believe the only instance of importance is that on October 29th, 1836. Immediately after my letter appeared in the *Times*, the Rev. L. Blomefield (formerly Jenyns) kindly called my attention to this fall, and to the account of it given in his excellent "*Observations in Meteorology.*" The following is the paragraph :—

"The last week in October, 1836, was remarkable for its severity, there being sharp frosts at night, and a heavy drifting fall of snow, which lay on the ground [at Swaffham Bulbeck, Cambridge] to the depth of several inches for days afterwards. I never remember any such snow as this so early in the season before. Newmarket Heath was so covered with snow (it being the time of the

races), that it was actually found necessary to sweep the course before the horses could run. A great deal of fruit was still ungathered, and the apples in many places were hanging upon the trees, coated with snow."

Whistlecraft, in his *Climate of England*, reports that at Thwaite, near Bury St. Edmunds, Oct. 29th, 1836:—

"A fall of snow for many hours, to near a foot in depth, with sharp frost (28°) at night. 30th.—Sharp frost and some snow.

G. J. SYMONS.

## THE RAINFALL OF OCTOBER, 1880.

The fall of rain last month was exceptional in several respects, an interim note upon the subject may therefore be acceptable.

In some parts of England the fall was greatly in excess. We do not yet know of any instances more remarkable than some of those quoted in *British Rainfall* 1865, page xxxi., as having occurred in the south-east of England in that year, but that month and the past bear some resemblance. The following table shows the stations arranged in the order of their excess above their average.

| DIV. | COUNTY. | STATION. | 1880. | | | | 1865. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Total. | Average, 1870-79. | EXCESS. | | Total. | EXCESS. | |
| | | | | | Amt. | Per cent. | | Amt. | Per cent. |
| | | | in. | in. | in. | | in. | in. | |
| II. | Kent ..... | Acol, Margate ..... | 8·08 | 2·26 | 5·82 | 258 | 6·75 | 4·49 | 199 |
| VII. | Lincoln ... | Boston ..... | 7·14 | 2·03 | 5·11 | 252 | 4·62 | 2·59 | 127 |
| II. | Surrey ... | Wimbledon ..... | 8·46 | 2·51 | 5·95 | 237 | 5·97 | 3·46 | 138 |
| II. | Kent ..... | Bromley Common.. | 8·15 | 2·92 | 5·23 | 179 | 6·95 | 4·03 | 138 |
| II. | Kent ..... | Maidstone, Hntn. C. | 6·82 | 2·46 | 4·36 | 177 | 7·81 | 5·35 | 217 |
| II. | Kent ..... | Hythe ..... | 10·25 | 3·86 | 6·39 | 166 | 9·43 | 5·57 | 144 |
| II. | Hants. ... | St. Lawrence, I of W | 8·26 | 3·62 | 4·64 | 128 | 10·96 | 7·34 | 203 |
| I. | Middlesex | Camden Square ... | 5·78 | 2·70 | 3·08 | 114 | 6·20 | 3·50 | 130 |
| VI. | Hereford. | The Graig, Ross ... | 5·75 | 2·83 | 2·92 | 103 | 4·98 | 2·15 | 76 |

The greatest fall in the British Isles during the month, was 10·92 in., at Glenthorne, Lynmouth, Devon, but although there is, unfortunately, not yet a long average at that station, the fall of eleven inches there is not nearly so exceptional as that of eight inches at Margate.

In the English Lake district, in the south-west, and centre of Scotland, and in many parts of Ireland, the month was extremely dry. At the Stye, in Cumberland, where the average fall in October is about seventeen inches (432 mm.) the fall was only 2·70 inches, or one-seventh of the average.

In Kircudbright, also, and in Dumfriesshire, the fall was scarcely noe-seventh of the average, and the following note from Mr. Carmichael, of Arthurstone, Meigle, shows the state of drought in parts of Perthshire and Forfar:—

"The rainfall for October has been very little here, the total for the month being 0·80 in the garden gauge and 0·81 at the house. At Balbrogie ford, where the Isla and the Ericht rivers meet and join in one, they have not been so low for 19 years. The Isla drains Glenisla and the Grampians surrounding it, the Ericht drains Glenshee and Glenbeg and also Strathardle. This shows, I think, a very dry month in the mountain district."

There were three considerable falls of rain during the month.

(1.)—On the 4th, preceded and followed by small falls of about a quarter of an inch on 3rd and 5th. The falls on the 4th exceeded 2 inches at several stations in Devon, Cornwall, and S. Wales, the largest amounts were 3·22 in. at Glenthorne, 2·50 in. at Langtree Wick, Torrington, Devon, and 2·44 in. at Babbacombe, Torquay, Devon.

(2.)—A local fall in Kent on the 9th of between 2 and 2½ inches.

(3.)—A rather widespread and heavy fall occurred on the 26th and 27th. The centre of it seems to have been between Holyhead and Kingstown, for the Dublin and North Wales returns are nearly equal. The following are a few of the heaviest falls:—

| DIV. | DIVISION. | STATION. | FALL ON OCTOBER | | | |
|---|---|---|---|---|---|---|
| | | | 25th. | 26th. | 27th. | 28th. |
| | | | in. | in. | in. | in. |
| V. | Devon | Dartmoor | ·55 | 2·00 | 1·19 | — |
| IX. | York, W. R. | Arncliffe | — | ·37 | 2·10 | 1·07 |
| ,, | ,, ,, | Ripon | — | ·47 | 2·15 | 1·30 |
| XI. | Radnor | Rhayader | ·13 | 2·16 | 2·40 | ·15 |
| ,, | Montgomery | Llanwddyn | — | 1·50 | 2·04 | ·34 |
| ,, | Canarvon | Port Madoc | — | ·50 | 3·06 | ·75 |
| ,, | Isle of Man | Douglas | ·05 | 1·03 | 2·00 | ·13 |
| XX. | Waterford | Waterford Gas Works | ·22 | 1·02 | 2·51 | — |
| XXI. | Meath | Monkstown | — | ·78 | 2·33 | ·47 |
| ,, | Dublin | Phœnix Park | ... | 1·11 | 3·03 | ·26 |
| ,, | ,, | Fitzwilliam Square | ... | ·78 | 2·74 | ... |
| ,, | ,, | Navan (Balrath) | ... | 1·60 | 2·00 | ·04 |

## THE RONALDS LIBRARY.

THE Society of Telegraph Engineers celebrated on Wednesday last the completion of a very large and useful work. The late Sir Francis Ronalds, F.R.S., was one of those clear sighted, and clever, but unobtrusive men, whose merits are usually discovered and recognized about fifty years after the bulk of their work is done, and therefore generally it is after they are dead. Ronalds lived to the

age of 95, and hence he lived long enough to see some of his merits recognized, for he was knighted in the 83rd year of his age, and received a Government pension of *seventy five pounds* per annum.

Without reopening the question of priority in the introduction of the Electric Telegraph, we may just mention that Ronalds worked a system of Electric Telegraph in 1816, and published the description of it in 1823, whereas the patent of Messrs. Wheatstone and Cooke was not taken out until 1837.

In 1843 Ronalds was appointed first Director of Kew Observatory, which appointment he held until 1852. And it was while holding that office, that he arranged the excellent set of Atmospheric Electric Apparatus described in Walker's translation of Kaemtz's Meteorology, and also that he devised the system of photographic registration of meteorological insruments which, with some improvements, is now adopted by the Meteorological Council.

During the whole of his life Ronalds was a persevering collector, not merely of books and tracts upon electricty and magnetism, but also of every scrap of information respecting the literature of the subject on which he could lay hands. And, although meteorology was with him a collateral subject, he collected a considerable mass of information upon that head. After resigning his appointment at Kew, Ronalds spent many years on the Continent, with his eyes and his pocket ever ready for any rarity requisite for his library. The final result was a library containing about 9000 separate works, and a catalogue containing more than 13,000 entries.

Ronalds at first contemplated leaving this library to the Royal Society, but considering that its library already contained many of the works, and that, therefore, a great accumulation of duplicates would result, it was thought better to offer it to the Society of Telegraph Engineers. That Society, though of recent formation (1872), has rapidly assumed a leading position among Scientific Societies; it accepted the Library on the conditions laid down in the deed of gift, viz., that the Library should "be preserved entire," that it should be rendered "of as much use as possible to such persons as should be engaged in the pursuit of electrical science and other cognate sciences," that all the books should be bound, and that the catalogue should be printed entire.

On Wednesday, Nov. 10th, the President of the Society (Mr. W. H. Preece, M.I.C.E.), invited the Members of the Society, and others interested in the subject, to celebrate the completion of the work. We are glad to be able to say that we consider it in every respect worthy both of Ronalds and of the Society of Telegraph Engineers. Concerning the catalogue, a well printed volume of 564 pages, as it has been our duty, for another object, to read every one of the 13,000 entries it contains, we ought to speak with some authority, and we are glad to say that it is exceptionally accurate, and a work whereof not only the editor (Mr. Alfred J. Frost), but the editor's countrymen have reason to be proud.

## INTERNATIONAL METEOROLOGY.

The International Meteorological Committee, appointed by the Congress of Rome, held its first meeting at the Observatory, Berne, from the 9th to the 12th September. All the members of the committee, nine in number, were present. Their names are as follows :—

Prof. H. Wild (President), Mr. R. H. Scott (Secretary), Profs. Buys Ballot and Cantoni, Capt. de Brito Capello, Profs. Hann, Mascart, and Mohn, and Dr. Neumayer. The following is a brief notice of the most interesting results of the meeting :—

**The International Comparison of Standard Instruments.**—The original scheme for this undertaking was based on the supposition that thirty-six European Observatories would take part in it, each paying a contribution of about £15.

The number of acceptances of the proposal, up to the date of the meeting, was, however, insufficient to justify the committee in commencing the comparison, and it was, therefore, determined to recommend each country to carry out a careful comparison of its own standard instruments, with those of neighbouring countries.

**The International Simultaneous Observations.**—The proposal recently made by the Chief Signal Office, Washington, to change the time of this observation, from 0h. 43m. to 0h. 8m. p.m., was discussed, and it was resolved to accede to the proposal, notwithstanding the inconvenience which the change might entail in individual systems of observation.

**The Proposal for Concerted Arctic Observations.**—The International Polar Commission, appointed at Hamburg, in October, 1879, presented a report of a meeting it had recently held at Berne, and announced that Count Wilczek and Lieut. Weyprecht had consented to postpone their expedition to Nova Zembla until 1882, in order to allow of more time for the organization of the other expeditions destined to co-operate with them. The International Committee resolved to aid the scheme by all the means in their power.

**The Publication of Data referring to Rain, &c.**—A proposal, made by Dr. Köppen, for an improved method of publication of information relating to rain, snow, &c., was ordered to be circulated among the different observatories, in order to obtain opinions as to its suitability.

**Telegraphic Communications with the Atlantic Islands.**—Capt. Hoffmeyer submitted a resolution as to the desirability of laying cables to the Faroes, Iceland, Greenland, and to the Azores. The committee expressed their hope that it might be found possible to lay these cables, which would be of very great importance for the weather service of Europe.

**The publication of Average Values for Meteorological data.**—The committee, at Capt. Hoffmeyer's suggestion, recommended that all meteorological organizations should publish regularly the

mean values for the most important elements for the Telegraphic and International Stations.

**The Catalogue of Meteorological Literature.**—A proposal, made by Dr. Hellmann, of Berlin, for the preparation of such a catalogue was considered. Dr. Hellmann stated that he had calculated the cost of preparation of the catalogue of printed books and memoirs at about £550, and that of printing and publication (1,000 copies) at about £750.

Several of the members of the committee promised to aid in carrying out the scheme, if it were undertaken, by the preparation of catalogues of the literature which exists in their own individual languages. The subject was finally referred to Mr. Scott and Dr. Hellmann, with power to act if they found sufficient encouragement.

As to the catalogue of unpublished records of observations no definite resolution was adopted.

**International Tables for the Reduction of Observations.**—It was stated that a publishing firm in Leipzig was prepared to print and publish such tables at its own risk, if the copy were delivered to them. The subject was referred to Prof. Mascart and Prof. Wild for the preparation of a definite plan for the calculation of the tables.

The committee will include in its report, which will shortly appear, a notice of the progress made in each country in carrying out the resolutions of the Congress at Rome.

It only remains to say that the members of the committee were most hospitably entertained by the Federal Council, and by the Municipality of Berne.

## THE SANITARY INSTITUTE.

### SOME DEFICIENCIES IN OUR KNOWLEDGE RESPECTING HEALTH RESORTS.

*(Concluded from p. 139.)*

And I think that few persons have the least idea of the number of the mineral springs and sea bathing places in the British Isles. Many years ago when investigating the rainfall at some of our Health Resorts, I compiled a list of those that I then knew of; the total number was rather more than three hundred, but having learnt of many since, and made the list far more extensive than any that I know of, I have inserted it in this paper ir the hope that it may prove an acceptable contribution to our Transactions.

At the outset, however, it is necessary to consider what constitutes a health resort. The definition is by no means easy. Are all places where mineral springs exist to be called health resorts? if so, scores of places where there is not the slightest accommodation for visitors, and of which 999 persons out of every 1000 have never heard, must be included. Are all seaside towns and villages to be considered health resorts? some of them are, we fear, far from being either salubrious or adapted for receiving visitors. Are we to exclude all places which have neither mineral springs nor sea bathing? if so, we must exclude some localities which are extremely well adapted for the restoration of persons suffering the penalty of "life at high pressure."

I think, that in this matter, as in most others, no hard and fast line is possible, and the course which I have adopted is, therefore, an intermediate one.

*(The list of about 500 health resorts will appear in the Transactions).*

I purpose dwelling chiefly upon our ignorance of the climates of our health resorts. But before passing to that, I wish to say a few words respecting the literature of the subject. How is it that we have no standard work in which the merits and demerits of all our mineral springs, sea-side bathing places, and health resorts are impartially set forth?

I am far from ignoring the thousands of more or less ambitious books, each demonstrating that Slowcombe-on-Sea is equally well adapted for a winter and for a summer health resort, that it possesses every natural advantage, and that the sanitary arrangements are perfect. Added to this, there is a gradually rising stream of prospectuses from so-called hydropathic establishments which, without exception, chant the praises of the places whence they emanate. But all these are necessarily, inevitably one-sided.

And our general treatises, where are they? I may be referred to Sir James Clark's *Sanative Influence of Climate*, an excellent book for its date, but the last edition was issued thirty-four years since, and it only devotes 70 pages to British Health Resorts.

Dr. Granville's *Spas of England*, 3 vols., published in 1841, is far more voluminous, but if the gossip and verbiage were struck out, it would leave little, if any, more information than is given by Sir James Clark, and all of it, be it remembered, is forty years old.

The more recent works, though I do not wish to say anything against them, leave much to be desired. What have we to compare with Lombard's *Traité de Climatologie Médicale*, in three or more volumes? with Dr. von Graefe's *Jahrbucher für Deutschlands Heilquellen und Seebäder?* or with the sumptuous quarto published for several years in Paris with the title of *Album universel des Eaux Minerales, des Bains de Mer, et des Stations d'Hiver*.

Not one of these, however, comes up to my own idea of what is required, and, what is more practical, of what I believe it would pay to publish. In the first place, I do not think that any one person is competent to write the book. Because (and I like to prove each proposition I lay down) it would not be easy to name a person who would command universal respect as (1) a physician, (2) a water analyst, (3) a geologist, (4) a meteorologist, (5) a sanitary engineer, and (6) a statistician. And I hold that a proper, full and true report upon Scarborough, for example, ought to contain data on all these heads, and it ought to give a map (with altitudes) of each town on the scale of at least two inches to the mile, one or two views, details of the water supply and drainage.

Let me, however, say a few words as to how I think it possible to carry out this scheme to its full extent, and to defray the cost of the perhaps half-a-dozen volumes which it would fill.

In the first place, everything should be done to suppress the personal element in the book. It should be brought out under the auspices of some public body, perhaps a committee comprising representatives of the leading Medical, Sanitary, and Scientific societies would command the widest respect. Then there must be one editor in chief, and sub-editors for each of the branches already named. And every paragraph throughout the volume should be initialled, so that no responsibility be shirked.

As the preliminiary basis of the publication, an exhaustive series of questions (together with an explanatory note), should be sent to the official representative of each town—the Mayor where there is one, whom failing the Chairman of the Local Board, or, in the absence of both, the leading medical practitioner. But these statements would merely serve as a basis; there must be a personal visit by an inspector appointed by the committee, and information must be collected from all possible sources.

As regards the mineral waters, properly attested specimens must be taken of each, and all must be analyzed under the supervision of a single analyst, and the results published on a uniform system.

I have not shown how the cost of this is to be met. Probably it would not be more than the sum spent yearly in advertisements by two or three of the largest hydropathic establishments. See for instance the hundreds of boards

respecting Ben Rhydding at the railway stations throughout the country. Fifty pages of advertisements in the last volume would do no harm to the book, and there is scarcely any price per page at which it would not be profitable to the hydropathic establishments and the larger hotels to insert illustrated prospectuses.

Such a work as this would be a necessity for the consulting physician, and would be of great interest to scientific men; well illustrated, and treating as it would do of many of the most beautiful spots in our country, it would find its way into the homes of the wealthy, and as the standard authority upon the subject, it would find a sale on the Continent, in our Colonies, and in the United States.

I am aware that I have sketched a large, and perhaps I shall be told a visionary scheme. Be it so. There is no harm in placing upon record that which is expedient, even if we cannot carry it out at once. We have pointed out the data required, and in the course of time they will be accumulated.

And now for the Climatology. Of course, one essential feature of the work is a full report on the climate of each health resort. I am sorry to say that that is what scarcely anyone can give. This a sweeping statement, which, of course, I must prove to be true. In the first place, to show you that this is no temporary whim on my part, I ask permission to read a paragraph which I wrote in 1866, and published in 1867 in a little book (long since out of print), entitled *Rain, How, When, Where and Why it is Measured*:—

"It would be of immense benefit to the medical profession and the public at large, to know with truth and absolute impartiality the relative climates of our various health resorts, but at present very little is known. There are a host of local treatises on 'The Climate of Blankwater,' &c., but they are mostly advocates of the place whence they take their title. We have also some general treatises on the subject, but they are necessarily based on the returns made by persons interested in the popularity of the places in which they reside, and most of them have placed their instruments as well as they know how, but the result is diverse indeed. How, then, can the indications of their instruments be comparable? Moreover, there have been cases strongly indicating a desire to 'make things pleasant,' by slight departures from impartiality in recording the observations, and hence (unjustly) there is a widespread want of confidence in returns from fashionable health resorts. This should not be. Might it not be removed by the local authorities at each appropriating a small portion of open space to the erection of a set of meteorological instruments, properly verified and properly mounted, and having them regularly recorded by one or more persons? Let the book of observations be always open to public inspection, let whoever takes the observations add his initials, and let the instruments be always readily accessible on application. This proposal might cost each town £10 or so, not more, and it would soon confirm the accuracy of most of those, on all of whom the records of *some* have cast suspicion."

The great defects of the meteorological observations of byegone years arise from the fact that the importance of absolutely identical methods of observation and record was not fully realized, or at any rate was not acted upon. It may have been thought that with a staff of voluntary observers it was difficult to ensure absolute uniformity, and that if a paid observer breaks rules the matter is soon rectified, but when the observer buys all his instruments, and offers of his own free will to send you copies of the observations he makes, it is less easy to obtain strict uniformity. At least, I suppose it must have been so, though my own experience of amateur observers is that they will do almost anything that they are asked. However, whatever may have been the cause, there is no denying the fact that absolutely rigorous identity in the mode of observation is of very recent date. But since getting a Royal Charter, proper offices and a paid staff, the Meteorological Society has been doing everything in its power towards ascertaining the precise characteristics of English climate. It has now between 80 and 100 stations,

with identical instruments, all mounted uniformly, all read at the same instant of local time, recorded and in every respect discussed upon a uniform system, all the instruments tested and verified, and every station visited by the Society's inspector.

A map of the stations and a set of the instruments are now before you. And from the former you will see what is the deficiency which I wish to see rectified. Take the coast from the Thames to the Land's End. We find the following sea-bathing places without any records being sent to the Society respecting their temperature or humidity :—Herne Bay, Westgate, Margate, Broadstairs, Deal, Dover, Folkestone, Sandgate, Hythe, Hastings, St. Leonards, Seaford, Brighton, Littlehampton, Bognor, Ryde, Sandown, Shanklin, Freshwater, Weymouth, Charmouth, Lyme Regis, Axmouth, Seaton, Exmouth, Dawlish, Looe, and Penzance. Twenty-eight places on the South Coast alone, each doubtless possessing features different from every other, slight, probably, in some cases, as, for example, Littlehampton and Bognor, but extremely marked in others, as, for instance, Margate and Penzance, or to take two nearer places, Ryde and Shanklin.

I started by stating that I wished to obtain rather than to afford information. Have I not finished by showing a wide field for useful work ?

## THE WEATHER IN OCTOBER.

During the 1st, a rather deep depression was formed over the North Sea, whence it moved away E. ward to the S. of Sweden during the following night, causing a rapid decrease of pressure over the S. of Scandinavia, and a brisk one over the whole of these Islands and France, so that the anticyclone which lay in the S.E. at the close of September disappeared, and the highest readings were reported from France. The bar. continued falling during the next 24 hours in all parts of W. Europe, except Scandinavia, and several small subsidiary disturbances passed in a S.S.E. direction down the North Sea, one of which occasioned moderate or fresh N. or N.W. gales in the N. and N.W. of our Islands. The large area of high pressure over France broke up entirely, and readings over Ireland became comparatively high. The charts of the 4th shewed two new depressions—one over the Bay of Biscay, and the other over the Gulf of Bothnia, the former producing moderate to strong E. winds over the Channel, S.W. England, and the whole of Ireland, the latter moderate N. winds over Scandinavia and N. Scotland.

Very unsettled weather, with remarkably heavy rain, was experienced during the week (5th–11th), except in the W. and N.W., where it was moderately fine, but cold.

The disturbance, whose centre was over the mouth of the English Channel on the 4th, moved a little N. during the night following, and became much deeper, so that, while E. gales set in over the N.E. and N. parts of England and Ireland, the wind shifted to S. and S.W in the Channel, and temp. rose considerably. By the morning of the 6th this centre had reached the Humber, and by the 7th was over the Baltic. Pressure began to increase in its rear ; but this rise was checked by the advance to over the Scilly Islands of a shallow disturbance, which, at that stage of its progress, began to move W. ward, the bar. hence rising over the whole of W. Europe. During the night (8th–9th), however, this depression suddenly passed E. wards, its centre being, at 8 a.m. on the 9th, near Jersey, where the bar. fell ; but at all other places pressure still increased. In the course of the 11th, the depression travelled a little to the E. of Jersey (and caused fresh or strong gales from the E. or N.E. on the English S.E. coast) but moved W. wards again subsequently, till it occupied much the same position as it did on the morning of the 9th. It soon afterwards disappeared, and then the bar. rose again over the whole of W. Europe, the charts of the 11th shewing a large area of high pressure over the northern parts of our Islands and the North Sea.

Temp. was less than the average throughout our Islands, the deficit ranging from 5° in central England to 1° in S. England. The highest max. (67°)

occurred at Barnstaple on the 11th. The lowest of the min. (29° or 30°) were reported from central Ireland and Glenalmond.

Rainfall was equal to the mean in S. Ireland, but less in the W. and N.W. Heaviest fall: 3·72 inches in London; lightest fall: 0·02 at Londonderry.

Bright sunshine shewed a decrease everywhere, except N. Ireland and E. Scotland. Max. duration: 43 hours at Glenalmond; min. duration: 3 hours at Leicester, 5 hours at Hillington.

The weather during the week (12th–18th) was very fine and dry in the S.W. of our Islands; dry, though not nearly so bright, elsewhere. Rather thick fog prevailed at times in S.E. England and S. Scotland.

Pressure decreased rather briskly over the Netherlands and N.E. France in the course of the night (11th–12th); but in the W. of our Islands and France the bar. rose, the area of highest pressure hence moving somewhat to the W. The charts of the 13th shewed that this disturbance over France had disappeared, while a depression had advanced from the W. over Lapland. This passed away during the 13th, and the bar. rose over all W. Europe, the change being greatest on the English S.E. coast and over France; but an equally general decrease of pressure took place on the next day. Over these Islands and their neighbourhood the change was uniform; but varied over Scandinavia from 0·02 to 0·29 (where pressure was previously lowest), so that a broad band of high pressure lay over Great Britain, N. France, and N. Germany, while over N. Scandinavia a large area of low readings was shewn, and a small subsidiary disturbance over the Skager Rack. On the 15th, the bar. rose a little over Scandinavia, owing to the disappearance of the depression; but over these Islands and France, the mercury continued to decrease slowly and steadily. During the 18th and following night an important disturbance passed from W. to E. to the N. of our Islands, and at 8 a.m. on the 19th, was over S. Scandinavia; a subsidiary depression appearing simultaneously over Scotland. An anticyclone (30·1) was formed over the S.W. coasts of our Islands, the English Channel, and N. France.

Temp. slightly above the mean in E. Scotland, but below it elsewhere; in central England the deficit was as much as 5°. The highest of the max. were 62° at Loughborough, 61° at York, Nottingham, and Prawle Point, and 60° at Kelstern. The lowest of the min. occurred at Markree Castle on the 12th, when the ther. receded to 29°; but at most other places the min. took place on the 15th.

Rainfall was nil in S.W. England; much less than the average elsewhere, except at Nairn, where the total was 0·05 inch in excess, and at Hastings, where the deficit was only 0·01.

Fair weather was experienced over the greater part of our Islands during the week (19th–25th); but in S. and S.W. England it was dull and very wet. Snow fell in many places, and on 20th was very heavy in S.E. England; also hail showers at some places.

The small depression which was over our S.W. coasts on the morning of the 19th, grew much deeper during that day, and a brisk decrease of pressure took place over these Islands and France (the fall exceeding half-an-inch at Jersey). This disturbance passed E.N.E. up the English Channel on the 20th, and was over Denmark on the 21st. The bar. consequently rose over the whole of our Islands; but during the night following a deep depression advanced across the Bay of Biscay (its centre being near Brest at 8 a.m. on 22nd), causing a rapid decrease of pressure on our S.W. coasts, and in N.W. France, and a slight fall over the whole of England and Ireland; while in Scotland and the countries to the E. of the North Sea the bar. rose. The charts of the 23rd shewed the depression to be over the Channel. During the day, however, it passed out again to the Atlantic, beginning rapidly to disperse. A very brisk rise of the bar. then took place, the change varying from 0·6 inch in the Channel to less than 0·10 inch in Scotland; but during the night (24th–25th) pressure decreased considerably in the N. of Scotland, owing to the arrival over that district of a small, though well-marked, depression; while in France, and on the E. shores of the North Sea, the bar. rose, so that the area of highest bar. readings was

now over N.W. France. The general conditions on the next day were extremely unsettled, owing to the existence over the Scilly Islands and the extreme S.W. of Ireland, and, in the next place, over Denmark, of depressions which occasioned a decrease of pressure over all W. Europe, the change being greatest on our S.W. coasts and Denmark. The area of highest readings was now shifted to S. France; and in N. Scotland, whence the disturbance of the 24th had passed on E. wards, an area of comparatively high pressure was formed.

Temp. considerably less than the mean in all districts, the deficit ranging from 8° in N. Ireland to 11° over S. and central England. The highest of the max. was 55° at Prawle Point; and the lowest of the min., 19° at Markree Castle, and 21° at Parsonstown and Brookeborough.

Rainfall above the average in S. and S.W. England, and E. Scotland; much less elsewhere. Heaviest fall: 3·84 inches at Falmouth; lightest fall: 0·03 at Markree Castle.

Bright sunshine was of longer duration in all districts except S. and S.W. England. Max. duration: 43 hours at Glenalmond; min. duration: 13 hours at Hillington, 14 in London.

Very cold, unsettled, and boisterous weather prevailed during the last five days of the month. Remarkably heavy rain fell at nearly all places; snow and hail showers were reported from the north, and a thunderstorm from Southampton. The 31st was, however, much less unsettled.

The depression noticed as being in the S.W. on the morning of the 25th, became very deep during the night (26th-27th). It remained stationary, however, and appeared to "throw off" small subsidiaries, which travelled slowly eastward up the Channel and over S. England. The bar. fell everywhere except in Scandinania; but the areas of high pressure in S.W. France and N.W. Scotland were still shewn. The wind was S.W. over France and S.W. England; but E. in all other parts of England and over Ireland, and N. in Scotland: in the W. of our Islands it blew a hard gale. The charts of the 28th exhibited a remarkable depression, passing E.N.E. over these Islands, having, apparently, two centres of 28·7 and 28·8 respectively, one over the British Channel, the other over the Humber. The decrease of pressure over our Islands varied from 0·73 at York, and 0·71 inch at Spurn Head, to 0·08 at Sumburgh Head. Gradients were very steep on nearly all coasts, and severe gales were general—that in the W. being N. in direction; W. and S.W. in the S. and S.E.; S. on our E. coast; and E. or N.E. on the more N. shores. In the rear of this disturbance (which by the morning of the 29th had its centre over Denmark), the bar. rose quickly; the gale subsided, except at Holyhead, Spurn Head, Capa Gris Nez, and Brussels, where the wind continued fresh or strong; and the weather improved generally. During the 30th, pressure increased somewhat over S.W. England, N. and central France; but in the north a slight decrease took place, caused by the passage across those parts of some small disturbances. On the 31st, the bar. fell slightly over Denmark and N. Germany, which fall was caused by the advance to that neighbourhood of a depression that was over the Shetland Isles on the previous evening (30th). Over the whole of our Islands, France, and Scandinavia pressure increased, an area of high and uniform readings being formed over France and our W. coasts, while gradients over the North Sea were somewhat steep.

Temp. several degrees below the average throughout our Islands, the deficit ranging from 5° to 8°. The highest of the max. was 60° at Dover, and the lowest min. was 23° at Bawtry; at most other places the min. ranged from 24° to 29°.

Rainfall less than the mean in N. Ireland; equal to it in E. Scotland; but elsewhere the amounts were very considerable. Heaviest falls: 3·89 at Dublin, 3·74 at Holyhead, 3·54 at Shrewsbury; lightest fall: 0·11 at Glenalmond.

Bright sunshine was less prevalent in most places than during the week preceding. Max. duration: 25 hours at Valentia; min. duration: 45 minutes at Leicester.

*Lowestoft.* H. E. M.

## WILL-WI'-THE-WISP.*

*To the Editor of the Meteorological Magazine.*

SIR,—I think you said in the Magazine some time ago that you had never met with, *in the flesh*, the man who had seen the *ignis fatuus*, or Will-wi'-the-Wisp. I beg to enclose a paragraph which I cut out of the *Fife News* newspaper some weeks since, and you will see from it that it has been seen there. I can also tell you that in 1832, when a boy herding cows on the farm of Crosshouses, near Kingskettle, Fifeshire, that I had frequent opportunities of seeing Will-wi'-the-Wisp, or "Spunkie," as it is called in the old Doric.

On the farm of Crosshouses was a bog, about 300 yards from the door of the dwelling-house, and it was in the bog—or rather over the bog—that I saw the light moving about. The best description I can give of it is that it resembled that of a lantern being carried about by a person for some twenty or thirty yards. Sometimes I had seen it move zig-zagly about these distances, and sometimes in a straight line, and always at the same rate of speed—that of a person's usual speed when walking.

My grandfather frequently saw it. Sometimes, when coming in from suppering the horses, he would cry in haste to come out and see "Spunkie" in Pilkim Moss, when I, and the others at the fire-side sitting, would run to the door to see it. When all of us were either less or more afraid of the wandering light, many times I have gone to bed at once—*after prayers though*—and buried my head among the bed-clothes that "Spunkie" might not get hold of me; for every person regarded the phenomenon with dread.

I saw it also in a bog called Powglass, on the farm of Dawnfield, close by Crosshouses, several times in the same year, 1832. I have lived since, as a gardener, in four counties in England, and four in Scotland, but never saw "Spunkie" in either of them. I must say, however, that no bogs—or rather quagmires, for Powglass bog partook more of the quagmire—were in close enough proximity to where I lived in those eight counties, to give me a chance of seeing Will-wi'-the-Wisp again.

Powglass bog and Pilkim bog have been both drained, and "Spunkie" is no longer seen there.

I have one or two cousins still living in the parish of Kettle, who, I am certain, will vouch for the truth of what I have stated to you.

Regarding the paragraph enclosed, I think I can procure the address of the writer of it, on application to the office of the *Fife News*, Cupar Fife. DAVID ELDER, Gardener.

*Silverbut Hall, Hawick, June 21st*, 1880.

"STAR.

"WILL-WI'-THE-WISP.—Under the rapid march of improvements in draining, Jack-wi'-the-Lantern, or Will-wi'-the-Wisp, has of late years been rarely seen in this quarter. One dark evening last week, however, the fiery imp was all activity in the locality of the peat moss, to the west of this, and created some excitement by his 'flitting, flaunting flame.' Decayed vegetable or animal

*See *Met. Mag.*, Vol. xiv., pp. 163.

matter, it is well known, is the cause of this light. In damp churchyards, in the olden time, where dead bodies were not buried far under the surface, such lights poured forth, and among our forefathers were familiarly known as 'dead lichts.' In a dark age, and while such lights were so frequently cast forth, it is scarcely to be wondered at that superstitious beliefs were closely associated with such appearances."—*Fife News.*

## SUPPLEMENTARY TABLE OF RAINFALL IN OCT., 1880.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 6·28 | XI. | Corwen, Rhug ..... | 5·67 |
| ,, | Margate, Acol ..... | 8·08 | ,, | Port Madoc ..... | 5·18 |
| ,, | Littlehampton ..... | 7·41 | ,, | Douglas..... | 5·82 |
| ,, | St. Leonards ..... | 8·07 | XII. | Carsphairn ... ..... | 2·32 |
| ,, | Hailsham ..... | 6·37 | ,, | Melrose, Abbey Gate... | 2·96 |
| ,, | I. of W., St. Lawrence. | 8·26 | XIV. | Glasgow, Queen's Park. | ·84 |
| ,, | Alton, Ashdell..... | 5·42 | XV. | Islay, Gruinart School.. | 1·45 |
| III. | Great Missenden..... | ... | XVI. | Cupar, Kemback..... | 1·95 |
| ,, | Winslow, Addington ... | 5·54 | ,, | Aberfeldy H.R.S. ..... | 4·44 |
| ,, | Oxford, Magdalen Col... | 5·30 | XVII. | Tomintoul..... | ... |
| ,, | Northampton ..... | 5·50 | ,, | Keith H.R.S. ..... ..... | 7·26 |
| ,, | Cambridge, Merton Vil. | 5·13 | ,, | Forres H.R.S. ..... ... | 3·52 |
| IV. | Harlow, Sheering ..... | 4·58 | XVIII. | Strome Ferry H.R.S.... | 2·58 |
| ,, | Diss ..... | 3·57 | ,, | Auchnasheen H.R.S. ... | ... |
| ,, | Swaffham ..... | 4·93 | ,, | Lochbroom ..... | 4·70 |
| ,, | Hindringham ..... | 4·90 | ,, | Tain, Springfield..... | 2·02 |
| V. | Salisbury, Alderbury... | 5·16 | ,, | Loch Shiel, Glenfinnan. | 4·48 |
| ,, | Calne, Compton Bassett | 4·40 | ,, | Dalwhinnie H.R.S..... | ... |
| ,, | Beaminster Vicarage ... | 7·50 | XIX. | Lairg H.R.S. ..... | 3·14 |
| ,, | Dartmoor, Princetown.. | 8·81 | ,, | Altnabreac H.R.S. ..... | 3·52 |
| ,, | Langtree Wick ..... | 6·56 | ,, | Watten H.R.S. ..... | 4·07 |
| ,, | Lynmouth, Glenthorne. | 10·92 | XX. | Fermoy, Glenville ..... | 3·34 |
| ,, | St. Austell, Cosgarne... | 8·28 | ,, | Tralee, Castlemorris ... | 1·44 |
| ,, | Taunton ..... | 5·85 | ,, | Cahir, Tubrid ..... | 3·35 |
| VI. | Bristol, Ashleydown ... | 5·90 | ,, | Tipperary, Henry St.... | 2·78 |
| ,, | Ross ..... | 5·75 | ,, | Newcastle West ..... | ... |
| ,, | Wem, Sansaw Hall..... | 5·62 | ,, | Kilrush ..... | 1·21 |
| ,, | Cheadle, The Heath Ho. | 4·07 | ,, | Corofin ..... | 1·38 |
| ,, | Bickenhill Vicarage ... | 5·42 | XXI. | Kilkenny, Butler House | ... |
| VII. | Melton, Coston ..... | 5·91 | ,, | Carlow, Browne's Hill.. | 2·94 |
| ,, | Horncastle, Bucknall ... | 4·46 | ,, | Kilsallaghan..... | 6·88 |
| VIII. | Walton-on-the-Hill..... | 4·71 | ,, | Navan, Balrath ..... | 5·88 |
| ,, | Broughton-in-Furness.. | 1·52 | ,, | Athlone, Twyford ..... | 1·37 |
| IX. | Wakefield, Stanley Vic. | 4·63 | ,, | Mullingar, Belvedere... | 2·91 |
| ,, | Ripon, Mickley ..... | 5·79 | XXII. | Ballinasloe ..... | ... |
| ,, | Scarborough..... | 6·12 | ,, | Clifden, Kylemore ..... | 2·17 |
| X. | Mickleton..... | 5·32 | ,, | Crossmolina, Enniscoe.. | 1·90 |
| ,, | Haltwhistle, Unthank.. | 3·62 | ,, | Carrick-on-Shannon ... | ·38 |
| ,, | Shap, Copy Hill ..... | 1·59 | XXIII. | Dowra ..... | ·71 |
| XI. | Llanfrechfa Grange ..... | 6·57 | ,, | Rockcorry..... | ·59 |
| ,, | Llandovery ..... | 5·18 | ,, | Warrenpoint ..... | 2·55 |
| ,, | Solva ..... | 4·61 | ,, | Newtownards ..... | 1·77 |
| ,, | Castle Malgwyn ..... | 5·32 | ,, | Carnlough..... | 1·40 |
| ,, | Rhayader, Nantgwillt.. | 8·11 | ,, | Bushmills ..... ..... | 2·33 |
| ,, | Carno, Tybritle ... ..... | 6·71 | ,, | Buncrana ..... | 1·85 |

# OCTOBER, 1880.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1860–5 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date. | Min. Deg. | Date. | No. of Nights below 32° In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | Camden Square | 5·78 | + 3·19 | ·99 | 9 | 20 | 66·3 | 2 | 29·6 | 21* | 4 | 6 |
| II. | | Maidstone (Hunton Court) | 6·82 | + 3·83 | 2·15 | 9 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss | 4·66 | ... | ·77 | 26 | 18 | 66·9 | 1 | 27·2 | 24 | 5 | 15 |
| III. | | Hitchen | 5·10 | + 2·55 | 1·26 | 6 | 20 | 60·0 | 5 | 26·0 | 23 | 6 | ... |
| ,, | | Banbury | 4·92 | + 2·49 | 1·24 | 4 | 17 | 63·0 | 1 | 25·0 | 24 | 7 | ... |
| IV. | | Bury St. Edmunds (Culford) | 4·45 | + 1·74 | 1·46 | 6 | 18 | 63·0 | 5 | 27·0 | 24 | ... | ... |
| ,, | | Norwich (Cossey) | 5·05 | + 2·71 | 1·13 | 6 | 21 | 64·0 | 5 | 30·0 | 24 | 2 | 6 |
| V. | | Bridport | 6·40 | + 1·37 | 1·18 | 26 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple | 6·45 | + 2·33 | 1·78 | 4 | 14 | 69·0 | 1,2 | 29·0 | 30 | ... | ... |
| ,, | | Bodmin | 8·03 | + 2·71 | 2·39 | 4 | 19 | 66·0 | 2 | 29·0 | 30 | 3 | 7 |
| VI. | | Cirencester | 5·77 | + 2·28 | 1·35 | 26 | 15 | ... | ... | ... | ... | ... | ... |
| ,, | | Shifnal (Haughton Hall) | 4·92 | + 2·68 | 1·61 | 27 | 16 | 61·0 | 1 | 24·0 | 20† | 9 | 12 |
| ,, | | Tenbury (Orleton) | 6·17 | + 2·94 | 1·96 | 4 | 13 | 66·5 | 1 | 22·2 | 24 | 9 | 10 |
| VII. | | Leicester (Town Museum) | 5·43 | ... | 1·44 | 4 | 15 | 60·8 | 2 | 28·1 | 20 | 5 | 23 |
| ,, | | Boston | 7·14 | + 5·02 | 1·65 | 4 | 14 | 60·0 | 1 | 27·0 | 20 | 6 | ... |
| ,, | | Grimsby (Killingholme) | 5·84 | ... | 1·71 | 27 | 18 | 60·0 | 1 | 30·0 | 20‡ | 3 | ... |
| ,, | | Mansfield | 5·86 | ... | 1·59 | 27 | 18 | 61·5 | 1 | 23·5 | 24 | 9 | 11 |
| VIII. | | Manchester (Ardwick) | 2·31 | — 1·22 | 1·26 | 28 | 12 | 62·0 | 1 | 26·0 | 21‡ | 5 | ... |
| IX. | | York | 3·67 | + 1·15 | 1·45 | 27 | 13 | 63·0 | 1 | 24·0 | 20 | 8 | 8 |
| ,, | | Skipton (Arncliffe) | 5·66 | — 1·00 | 2·10 | 27 | 14 | 60·0 | 14 | 22·0 | 19 | 8 | ... |
| X. | | North Shields | 3·80 | + ·52 | ·85 | 27 | 23 | 59·0 | 1 | 27·5 | 22 | 6 | 6 |
| ,, | | Borrowdale (Seathwaite) | 3·30 | —13·02 | ·90 | 25 | 13 | ... | ... | ... | ... | ... | ... |
| XI. | WALES. | Cardiff | 4·94 | ... | 1·45 | 26 | 15 | 63·4 | 1 | 28·5 | 21 | 4 | ... |
| ,, | | Haverfordwest | 5·27 | + ·08 | 1·50 | 26 | 12 | 64·0 | 1 | 24·0 | 23 | 7 | 13 |
| ,, | | Aberdovey | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno | 5·01 | + 1·05 | 2·23 | 27 | 13 | 63·3 | 1 | 30·0 | 22 | 3 | ... |
| XII. | SCOTLAND. | Cargen | ·75 | — 4·73 | ·24 | 18 | 7 | 62·4 | 1 | 22·4 | 22 | 8 | ... |
| ,, | | Hawick (Silverbut Hall) | 2·67 | ... | ·82 | 27 | 14 | ... | ... | ... | ... | ... | ... |
| XIV. | | Douglas Castle (Newmains) | 2·10 | ... | ·62 | 27 | 11 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Long (Arddaroch) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Kilmory | 1·25 | ... | ·33 | 30 | 9 | ... | ... | 19·0 | 20 | 18 | ... |
| ,, | | Mull (Quinish) | 1·55 | ... | ·58 | 30 | 15 | ... | ... | ... | ... | ... | ... |
| ,, | | Loch Leven | 1·70 | — 3·28 | ·50 | 29 | 6 | ... | ... | ... | ... | ... | ... |
| XVII. | | Arbroath | 2·24 | — 1·45 | ·53 | 5 | 12 | 64·0 | 1 | 26·0 | 20 | 4 | ... |
| ,, | | Braemar | 1·91 | — ·84 | ·28 | 2 | 14 | 57·6 | 1 | 11·0 | 20 | 13 | 27 |
| XVIII | | Aberdeen | 3·07 | ... | ·42 | 8 | 21 | 64·0 | 1 | 25·0 | 19 | 6 | ... |
| ,, | | Portree | 3·20 | — 7·58 | ·47 | 25 | 19 | ... | ... | ... | ... | ... | ... |
| ,, | | Inverness (Culloden) | 3·06 | + ·40 | ·57 | 25 | 9 | 58·5 | 1 | 25·8 | 22 | 7 | 20 |
| XIX. | | Dunrobin | 3·37 | + ·14 | 1·01 | 2 | 19 | 58·0 | 1 | 26·5 | 20 | 10 | ... |
| ,, | | Sandwick | 4·28 | — ·64 | ·64 | 2 | 24 | 60·0 | 17 | 29·2 | 20 | 6 | 15 |
| XX. | IRELAND. | Cork (Blackrock) | 2·72 | ... | ·99 | 26 | 9 | 70·0 | 1 | 22·0 | 29 | 7 | ... |
| ,, | | Darrynane Abbey | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Waterford | 4·80 | + ·40 | 2·18 | 27 | 10 | 63·0 | 1 | 27·0 | 21§ | 10 | ... |
| ,, | | Killaloe | 3·88 | — 1·14 | 1·53 | 26 | 12 | 72·0 | 1 | 24·0 | 30 | 8 | ... |
| XXI. | | Portarlington | 3·02 | — 2·11 | 1·06 | 27 | 15 | 63·5 | 1 | 26·5 | 21 | ... | ... |
| ,, | | Monkstown | 7·12 | + 3·20 | 2·33 | 27 | 13 | ... | ... | ... | ... | ... | ... |
| XXII. | | Galway | 1·11 | ... | ·71 | 26 | 6 | 66·0 | 1 | 26·0 | 21 | ... | ... |
| XXIII | | Waringstown | ·73 | ... | ·53 | 27 | 7 | 63·0 | 1 | 19·0 | 21 | 7 | 17 |
| ,, | | Londonderry | 1·45 | ... | ·36 | 18 | 16 | 59·0 | 1 | 30·0 | 22 | 2 | 12 |
| ,, | | Edenfel (Omagh) | ·67 | ... | ·21 | 27 | 10 | 58·0 | 1 | 18·0 | 21 | 14 | ... |

* And 30. † And 24, 30. ‡ And 24. § And 30.

+ Shows that the fall was above the average; — that it was below it.

# METEOROLOGICAL NOTES ON SEPTEMBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

CAMDEN SQUARE.—A thick covering of S on the ground on the 20th.

STRATHFIELD TURGISS.—I have noted yearly since 1856 the earliest date of S, and the fall on the 19th instant is the *earliest.*

HITCHEN.—The coldest October on record. S on the 20th; the earliest known.

BANBURY.—High winds on 6th, 9th, 10th, and 27th. T on 6th; S on 20th.

CULFORD.—A month notable for its extremes of temperature, in which we have had a taste of both summer and winter. The fall of S on the 21st was not so heavy here as in many districts.

BODMIN.—The month was remarkable for its heavy rainfall and for the singular oscillations of the bar. Mean temp. 47°·5.

CIRENCESTER.—A wet month; two heavy falls of R in short periods. Wind principally E. and N.E. in the middle of the month, and S.W. and N.W. in the othe parts.

SHIFNAL.—Rather a strange October, remarkable for extremes both of temp. and rainfall. The sudden cold of the 20th was not accompanied by heavy S, such as fell further south, but cut down all dahlias, &c. Falls of rain exceeding 1 in. in 24 hours occurred on three occasions; that of the 26th and 27th continued without ceasing for two days and a night, the total amount being 2·64 in., and resulting in such a flood as has not occurred since 1851. Prevailing winds, N.W., N., and N.E. A great crop of acorns and hips, but no haws or horse-chestnuts; potatoes a great crop and little disease.

ORLETON.—The mean temp. of the month was more than 6° below the average, and lower than that of any October for the last 25 years. The last half of the month was very cold with severe frosts. At 3 p.m. on the 4th a great R set in, which continued till noon on the following day, when 2·08 in. had fallen. At 8 a.m. on the 26th another great fall of R set in, which continued for 40 hours, when 2·53 in. had fallen, producing the greatest flood in the River Teme (excepting that of November, 1852) that has occurred since 1795. The sky was generally cloudy, with much fog, and there were only a few fine days.

BOSTON.—The greatest rainfall ever known in one month; the next greatest being 5·73 in. in July 1851. On the 4th and 5th 2·79 in. fell in 24 hours, the greatest ever recorded. The rivers and drains have all been higher than was ever known before, and land flooded on which the water was never known to stand before.

KILLINGHOLME.—Cold and very wet, except a week of pleasant weather from 12th to 19th.

YORK.—The heavy rainfall of the 27th and 28th (1·87 in.) caused a flood up to 12¼ ft. in the river (highest known about 15 ft.) Solar halos on 4th and 19th; S and H on 20th.

ARNCLIFFE.—Very wild in night of 27th and 28th. R in the two days, 3·17 in.

NORTH SHIELDS.—Very stormy on 28th; S on five days after the 19th.

SEATHWAITE.—Snow on mountains on 18th and 27th; gale on 28th; no fall of R exceeding 1 in. in 24 hours.

## WALES.

LLANDUDNO.—A dull, cold, and stormy month; rainfall 1·5 in. above the average. An excessive—I should say unprecedented—fall occurred on the 27th, accompanied by a heavy gale from the S.E., the quantity which fell in the 24 hours being 2·23 in. Mean temp. nearly 5° degree below the average.

## SCOTLAND.

CARGEN.—An unusually dry month, rainfall 4·49 in. below average; severe cold from 21st to 24th. The severe storms so general between the 26th and

30th were not felt here at all. A slight covering of S on the high hills on the 29th. Mean temp, (45°) 3°·7 below the average; L on 4th and 15th.

SILVERBUT HALL.—The first half of the month was fine and mild; keen frost set in on the 17th, and continued nightly till the 23rd; on the 27th and 28th there was a terrible storm of snow, sleet, rain, and wind, causing a high flood in the Teviot. On the morning of the 22nd the temp. fell to 17°, and few living in Hawick have ever seen such a keen frost and severe snowstorm in October.

BRAEMAR.—S fell on the 18th, and after that date unusually intense frosts.

ABERDEEN.—Prevailing wind N.W., and consequently the temp. was low with cold showers of R, S, and H; rainfall above the average. The aurora was seen on four nights; lunar halos were frequent. Weather stormy and unsettled.

PORTREE.—A very mild month; first S and frost on the 20th.

CULLODEN.—Frost severe for so early in the autumn, particularly from 4th to 12th, and from the 19th to the close of the month. A heavy hailstorm on 28th, and continued heavy showers throughout the day. Very little S.

SANDWICK.—The mean temp. of the month was not only 4°·7 below the average, but it was the coldest October during the last 54 years. Thus we have an uncommonly early winter after an uncommonly fine summer. The ground was covered with S during the 19th and 20th. Rainfall rather less than the average. Aurora on four nights.

## IRELAND.

KILLALOE.—The great rainstorm of the 26th and 27th was less severe here than in other parts of the country. The weather was splendid from the 7th to 25th, though the temp. was low and there were several sharp frosts. Wind N. or N.E. nearly all the month.

MONKSTOWN.—A strong gale from N.E., with heavy R, T, L, and H, commenced on night of the 4th, and continued during the 5th, bringing a very heavy sea; after that a spell of bright cool weather till the 26th, when another gale set in from E N.E., which continued for nearly three days with great violence, being the severest we have experienced for many years; it was accompanied by incessant R. The fall on the 27th, 2·330 in., is the largest I have ever recorded in one day, excepting the fall of 2·335 in. on August 13th, 1874. In that case it was simply a TS; this time it was preceded and followed by heavy falls, making the altogether unparalled amount of 3·575 in. in three days.

WARINGSTOWN.—A very fine and dry month; very sharp and early frost on night of 4th; intense frost on night of 21st.

LONDONDERRY.—Month extremely favourable for agricultural purposes; the finest we have had for many years. Prevailing wind N.W.

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## THE COMING WINTER.

*To the Editor of the Meteorological Magazine.*

SIR,—In compliance with the request contained in your kind and impartial article on my "Weather Predictions," (see *Met. Mag.*, vol. xv., p. 82), I beg to say that the coming winter should be somewhat colder than (39°·2) the average of the last 40 years. I will, with your permission, give in your next number my reasons for expecting this.

And now a few words as to the mean temp. of last July. The Greenwich long average for that month, that is, for the last 109 years, is 61°·6. The actual mean of last July at Greenwich was 61°·7; consequently that month was 0°·1 warmer than the average, and, at any rate, not a cold month as some have thought.—Yours, &c.,

GEORGE D. BRUMHAM.

SYMONS'S

MONTHLY

# METEOROLOGICAL MAGAZINE.

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## LONDON FOG.

IT is rather curious that simultaneously with the devotion of an unprecedented amount of time and talk to the discussion of London fogs, we have passed through an autumn and part of a winter singularly clear and free from fog.

In the winter of 1879-80 fog was unusually prevalent over the whole north-west of Europe, as a natural result of the meteorological conditions then dominant, viz., high barometric pressure, low temperature. and calm. Some persons suffer from cold, others are liable to bronchial affections. Hence when fog and frost co-exist, illness and mortality necessarily increase, but *all* the increase must not be charged against either *one* of the two factors.

In 1880 a rather thick and early fog occurred on Sunday, September 26th, and on October 13th *The Times* printed three letters and a leader upon the subject of fogs and fog prevention. This, and the fact that the subject is one upon which everybody feels competent to express an opinion, has led to the production of pages and pages of literature upon fogs. We certainly shall not follow with the stream, but try to sum up the whole matter (of which we have quite 50 pages before us) in two or three.

As to the cause of fogs there is perhaps no better authority than the paper by Mr. Dines in the *Quarterly Journal of the Meteorological Society*, Vol. V., p. 157, and the discussion thereupon. But it seems to us that the causes may be even more briefly stated than in that paper.

If water, or matter containing water, be warmer than the dew point of air resting upon it, the water will evaporate, and if the air be colder than the water the vapour in the air may become saturated with invisible vapour, and may, in addition, contain globules of water too minute for their weight to cause them to fall to the earth as rain, and which globules, breaking up the transparency of the atmosphere, produce what is called mist or fog.

Similarly, but conversely, if warm saturated air passes over ground which is much colder than itself, its capacity for retaining in an

invisible form all the water in it, is lessened by its own loss of heat, and the water, which it cannot hold invisibly, changes into the globular form, and so again we have the transparency of the air destroyed.

And this second explanation carries with it another point which may as well be disposed of, viz., the identity of cloud and fog. For see how perfectly this explanation accords with the cloud formation known as "pennants" from many isolated mountain peaks, and, to cite a single case, with the "table-cloth" at the Cape of Good Hope. A current of air relatively warm and damp drives against the summit of a lofty, and therefore, cold mountain; this chills the air, some of the vapour become visible, and a cloud is formed to the leeward of the mountain; but the cloud does not reach far, because the cooling influence of the mountain passes off and the vapour soon resumes its invisible form.

So much for fogs in general—the damp white normal fog of all parts of the world, where fogs exist at all.

We come now to London fogs, which are being execrated to an extreme extent. We should be sorry to have yearly to breathe such an atmosphere as that of the winter 1879-80, but as it appears to us that the injurious effects have been exaggerated, we shall endeavour to bring the matter forward for calm consideration.

Dr. Alfred Carpenter is desperately hard upon the fogs; he calls them "a mighty evil, every year increasing in intensity and slaying its tens of thousands before their time." He says: "Cold kills, but cold with London smoke kills with double weight and leads to innumerable sudden deaths, as the Registrar-General's tables convincingly tell us."

As regards the "mighty evil," we need only give another paragraph from the letter from which we have just quoted:—

"But the carbon was not the only evil present, for the smells which came up from the sewers were most marked, and had the cloud been accompanied by a falling instead of a rising barometer the stenches from the London sewers would have been still more formidable. But, Sir, there is a wonderful adaptation of circumstances to cases which excites my intense admiration. London is not completely handed over to the mercies of decomposing sewage. The smoke which enveloped London on this Sunday was not only a destructive agent but a protector. Soot is doubtless a deodorizer, and, possibly, a disinfectant. The albumenoid matter which escaped from the West-end sewers, and is sometimes the carrier of infective material, was fortunately deprived of its more serious miasm by the sooty atmosphere in our streets."

Then Dr. Carpenter (and also the writer of the leader in *The Times*) says that the fogs are every year increasing in intensity. We admit that it would not be easy to find a worse winter than that of 1879-80, but our own experience, and the result of *every* enquiry which we have made upon the subject, negative the statement. We believe that

the amount of obscuration has been nearly constant throughout the century, two causes having worked in opposite directions. In the first place the enormous increase in the area of the metropolis, and the substitution of roofs, pavements, and paved or macadamized and drained streets for many, many square miles of meadow and marsh land, has undoubtedly diminished the area whence evaporation could proceed, and has therefore *pro tanto* lessened the intensity of natural fogs. On the other hand, this same development of the metropolis has increased the number of smoking chimneys, and so may have made the fogs darker than they used to be. But in this respect it must not be forgotten that there is no proof that there are more chimneys *per square mile* than there used to be; therefore it seems that it is more probable that the area of the dark fogs has been increased than that they have become more dense.

As to the tens of thousands slain by the fogs, we hardly know what to say after Dr. Alfred Carpenter has called the fog of October a protector. But when he goes on to say, "Cold with London smoke kills with double weight and leads to innumerable sudden deaths, as the Registrar-General's tables convincingly tell us," we really are aghast. We thought it was becoming a recognized fact that London was one of the healthiest cities in the world, and yet this paragraph is enough to frighten anybody. As to the innumerable sudden deaths, of which the tables of the Registrar-General tell us. We did not know that the Registrar-General owned his department to be unable to number them. We have seen some sensational paragraphs in the otherwise very dry quarterly returns of that department, but a table showing "innumerable sudden deaths" from cold and smoke would be a curiosity.

A very rich idea was started by an anonymous writer in *The Times*, who considered that landlords and the owners of property in the metropolis were interested in the question, because "The number of houses to let is noticeable, and they will probably increase, for who that is not obliged, will continue to live in so oppressive and depressing an atmosphere, least of all bring up their children in it?"

*(To be continued.)*

## THE WEATHER IN NOVEMBER.

The first week was characterized by very fair weather in nearly all parts of the United Kingdom. Bright aurora was seen in almost all places on the evening of the 3rd.

The charts of the 3rd showed an anti-cyclone (30·3) extending from E to W. across Ireland, the N. of Great Britain, and the North Sea to Denmark; a rather deep depression over S. France, where the bar. fell 0·5 in.; and a second disturbance in N. Norway. By the following morning the centre of the former (which was then dispersing) was near Toulon, while the latter, advancing E. wards, caused a brisk decrease of pressure over the whole of Scandinavia. During the 4th the bar. rose quickly in France, slightly in Scandinavia, both disturbances having disappeared, but decreased over our islands. Next day the bar. fell generally—quickly so in the N., owing to the passage across the extreme N. of Norway of a large depression. A considerable change in the general distribution of pressure took place in the course of the night (7th–8th).

A rapid rise of the bar. began on our W. and N.W. coasts, spreading in a less degree over nearly the whole of our islands, while over the Channel and France, Denmark and S. Scandinavia, pressure decreased, small disturbances being shown in those neighbourhoods. In the N. of Norway and Sweden, as the depression travelled away, the bar. rose. During the night (8th–9th), however, a deep depression suddenly advanced to the N. coast of Scotland, occasioning a rapid decrease of pressure in Scotland, and a brisk decrease in almost all parts of our islands; in the S.W. in France, and on the E. shores of the North Sea, the mercury rose, so that an area of high pressure now extended over S. England, N. France, and the Netherlands, while over N. Spain an area of comparatively low readings was shown.

Temp. less than the average throughout our islands; over England the deficit varied 4° to 6°, elsewhere from 2° to 3°. The highest of the max. was 59° at Foynes. The min. occurred mostly at the earlier part of the week; the lowest readings (18° at Shrewesbury, 19° at Glenalmond) were recorded on the 2nd.

Rainfall considerably below the mean in all districts. Heaviest fall, 2·30 in. at Laudale; lightest fall 0·02 in. at Plymouth and Donaghadee.

Bright sunshine was more prevalent than in the preceding week, except in Ireland. Max duration, 36 hours at Aberdeen and Geldeston; min. duration, 11 hours at Glasgow.

Very dull weather prevailed in our islands during the next week, (9th-15th); heavy rain was all but general, and at some places in the N. showers of snow fell. A thunder-storm was experienced at Hastings on 15th.

The deep depression above noticed as being over N. Scotland on the morning of the 9th, subsequently moved S.E. wards, until on the morning of the 10th it was over Denmark. The bar. consequently fell quickly on the E. shores of the North Sea, and there was a brisk decrease in N.E. France and E. England. At the same time a separate decrease began during the night in the extreme S.W. of Ireland, while in Scotland, N. and Central England, pressure recovered. The report of the following day showed that pressure was then increasing on the E. shores of the North Sea and in N.E. France; but was decreasing in W. France, the whole of our islands, and Sweden. A large area of comparatively high pressure lay over France; considerable depressions were shown to the N. of Scotland and in N. Scandinavia, while some very small and shallow depressions passed slowly from W. to E., across the S. of these islands. Hence E. winds prevailed over the Bay of Biscay, and breezes between W. and S. in most other parts of W. Europe. Quite unimportant were the changes in the general distribution of pressure on the next day, but during the night (12th–13th) a deep depression advanced from the Atlantic to N. Scotland, and produced a fall of the bar. throughout W. Europe: the change varied from 0·74 in. at Haparanda, and 0·59 at Leith, to 0·01 at Rochefort, and 0·02 at Toulon. The charts of the 14th, and 3 following days, exhibited a remarkable state of things. The bar. had continued falling during the 13th, owing to the passage from S.W. to N.E. of two large depressions—the former being that noticed as near the N. coast of Scotland on the morning of the 13th, the latter a fresh disturbance from the Atlantic; the centres of both of these being below 29 inches. During the night (14th–15th), the bar. rose over the greater portion of W. Europe, but early on the 15th a new and brisk decrease began in the S.W. of Ireland, caused by the advance from the Atlantic of a fresh disturbance. Hence the chart of the 15th showed an area of high pressure in S. France, comparatively uniform readings in these islands, a disturbance off Ireland, and a deep depression over N. Norway. In the course of the following night (15th–16th) the depression in the W. of Ireland advanced to the neighbourhood of Holyhead, and proved to be deeper than either of its immediate predecessors, the reading at the centre being 28·45. In N.W. England the decrease exceeded an inch, and was more than 0·5 in. throughout our islands. In Scandinavia the bar. rose rapidly.

Temp. above the mean. in all parts of our islands. The max. occurred generally on the 13th, when a value of between 60° and 63° was registered over central and N.E. England. The lowest of the minima (varying from 19° at Glenal-

mond to 22° at Cirencester, and 25° at Brookeborough) were recorded on the 9th in England, and on the 15th over Scotland and Ireland.

Rainfall more than the average in all districts. Heaviest falls, 4·54 in. at Stonyhurst, 3·23 at Mullaghmore; lightest fall, 0·57 at Nairn.

Bright sunshine was of very short duration everywhere, Max. duration, 15 hours at Glenalmond; min. duration, 1 hour at Hillington.

The next week (16th–22nd) was distinguished by rather cloudy, very cold, and unsettled weather in all parts of our islands; much snow fell in the more N. districts, and sharp thunderstorms occurred at Dublin on 18th and 19th.

The depression travelled away rapidly during the 16th, and at 8 a.m. on the 17th, as shown on the chart, was over S. Scandinavia. The bar. fell 0·75 in. at Fanö, and 0·67 in. at Skudesnaes, but over the whole of our Islands and N. France pressure increased. The change in W. England exceeding 0·5 in. Several peculiar changes took place in the course of the following 24 hours. The appearance of a well-marked depression at the mouth of the Channel caused a rapid fall of the bar in the S.W.; but over Scandinavia, Denmark, Scotland, E. England and E. France the mercury rose. The wind was S. in France, E. in S. and W. England and Ireland, N. in Scotland and E. England, and blew a gale over the Bay of Biscay. This depression passed slowly E.N.E.ward during the 18th until, on the morning of the 19th, it was over N. Germany, and thence it passed on N.E.wards during that day, and disappeared. In its rear, pressure increased (the change amounting to 1·08 in. at Cuxhaven, and an inch at Yarmouth), and became high over England, the North Sea, and N. Germany on the 20th; but gave way rapidly on our W. coasts, owing to the advance from the Atlantic of a depression: this, however, did not advance much E.wards during the day (21st) and following night, but grew deeper apparently. Next day a slight rise of the bar. was reported from N. Germany, and a slight recovery from S. Ireland, but the mercury fell elsewhere, the change being considerable in the N. The depression in the W. did not advance, but appeared to shift obliquely along the W. coasts.

Temp. much less than the average throughout our Islands, the deficit ranging from 13°·4 at Glasgow, and 14°·2 at Silloth, to 2°·7 at Spurn Head. At the earlier part of the week the ther. was comparatively high, and a value of 57° was recorded at Cambridge; but a fall soon took place, and at the latter part of the week temp. was extremely low. The lowest of the minima, 12° at Glenalmond and 13° at Leicester, were registered on the 22nd.

Rainfall above the mean in N E. and S. England and S. Ireland; but below elsewhere. Heaviest fall: 2·55 in. at St. Leonard's; lightest fall: 0·04 at Hereford.

Bright sunshine shewed an increase everywhere. Max. duration: 31 hours at Pembroke; min. duration: 5 hours at Glasgow.

Mild weather was general in our Islands during the last week of the month. Rather heavy rain fell in the S. and W.; lightning was seen in several places, and thunder heard in London on the 25th and at Stornoway on the 26th.

The large depression on the W. coast had reached the Scotch N.W. coast by the morning of the 24th, and the N. coast by the next morning, when it had become much deeper (28·8): the chart of the 26th showed that this was then over N. Norway, while a new and deeper depression (28·5) succeeded to its former position, and caused a decrease of pressure in N. Ireland amounting to upwards of 0·5 inch: this disturbance, too, travelled away, taking the same course as the former, being over N. Norway on the morning of the 27th. In its rear pressure recovered fast, the rise varying from an inch in N. Ireland to 0·3 in. in S.E. England. Readings were now highest in S. France, lowest in Scandinavia. On the 28th a slight fall of the bar. took place within the area of high pressure over France, whilst a brisk rise occurred over our islands, especially in the N.: so that whilst readings remained highest (30·6) in the vicinity of Paris, lowest to the N. of Scotland, gradients became much less steep. Next day an increase of pressure began in E. France, the larger portion of Great Britain, and in Norway; but in W. France and in Ireland, the bar. fell. An anticyclone was formed over France, and a large depression was over

N. Scandinavia. During the 24 hours following, the bar. rose briskly in N. Scandinavia, owing to the disappearance of the depression; but fell quickly in all parts of W. Europe. The anticyclone kept the former position, whilst a large shallow depression (29·6) was shewn over the N. of Scotland, and two small subsidiaries over Ireland. Hence pressure was now highest over France, and lowest over N. Scotland and the Gulf of Bothnia.

Temp. was slightly above the average throughout our Islands. The max. were high for the time of year; ranging from 54° to 59°. The only occasion on which a low reading was recorded was the morning of the 23rd, when the ther. receded to 12° at Glenalmond, 17° at Leicester, 18° at Durham, Cirencester, and Silloth.

Rainfall rather less than the mean in central and E. England and E. Scotland; more elsewhere. Heaviest falls: 4·64 in. at Loch Sunart, 2·32 in. at Roche's Point; lightest fall: 0·10 in. at Spurn Head.

Bright sunshine was more scarce than during the week preceding. Max. duration: 22 hours at Dublin; min. duration: 3 hours at Glenalmond.

*Lowestoft.* H. E. M.

N.B.—In *Met. Mag.*, vol. xv., p. 155, line 27 from bottom of page, for "British Channel" read "*Bristol* Channel. This occurred in printing.

## THE WINTER OF 1880–81.

*To the Editor of the Meteorological Magazine.*

SIR,—In your last number I promised to give reasons for expecting a "somewhat colder winter than (39°·2) the average" of the last 40 years. The following are my reasons:—

1. When snow has been observed near London as early as October, a colder winter than the average has followed ten times in eleven. The following table shows this:—

| Year. | First Snow. | Where Observed. | Mean temp. of following Dec. to Feb., below 39°·2 at Greenwich. |
|---|---|---|---|
| 1810 | October 29th ... | Stratford and Clapton ..... | —2°·0 |
| 1819 | do. 21st ... | Tottenham and Stratford ..... | —4°·0 |
| 1820 | do. 22nd ... | do. do. ..... | —1°·4 |
| 1825 | do. 20th ... | do. do. ..... | —0°·9 |
| 1829 | do. 7th ... | do. do. ..... | —5°·9 |
| 1836 | do. 29th ... | Chiswick ..... | —0°·2 |
| 1838 | do. 12th ... | do. ..... | —1°·0 |
| 1848 | do. 18th ... | Greenwich ..... | +3°·2 |
| 1859 | do. 22nd ... | Camden Town ..... | —1°·8 |
| 1869 | do. 27th ... | do. ..... | —1°·8 |
| 1878 | do. 30th ... | do. ..... | —4°·6 |
| 1880 | do. 19th ... | do. ..... | ... |

Only one exception in 70 years will, I think, justify some confidence in the rule.

2. The mean rainfall of August in Scotland (according to the returns of all the stations in the said 50 station table given in your monthly *Met. Mag.*) is usually greater than the August mean of all the English returns that you give in the 50 station table. When,

however, this normal condition of things is reversed, and England appears wetter in August than Scotland, the succeeding winter has been colder than the average, at least, since 1865. The years 1869, 1870, 1878, 1879, and 1880 furnish the only instances of a reversal of the normal condition of things referred to, and, in each case, up to the present time the following winter has been cold.

3. Severe winters usually recur after about 41 years. The winters of 1788-9, 1794-5, 1796-7, 1799-1800, 1813-14, 1819-20, 1829-30, and 1837-8 were excessively severe, and they had their counterparts (in each case after an interval of 41 years) in the severe winters of 1829-30, 1835-6, 1837-8, 1840-41, 1854-5, 1860-61, 1870-71, and 1878-9. Forty-one years ago the mean temperature of the winter was 39°·6, which is 0°·1 colder than the present adopted Greenwich average of 20 years, but somewhat above the long (109 year) average. Forty-one years ago, however, the four months' winter—December to March inclusive—was as much as 1°·5 colder than the Greenwich average of 20 years. So, on the whole, we may reckon on the winter of 1880-81 being somewhat colder than the average, but still not much below the mean.—Yours, &c,

GEORGE D. BRUMHAM.

*Barnsbury, December 6th,* 1880.

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## ANEMOMETRICAL RESULTS AT MODENA.

*To the Editor of the Meteorological Magazine.*

[TRANSLATION.]

SIR,—I have the honour of communicating to you a new result respecting the velocity of wind at Modena which I have recently obtained.

By the discussion of twelve years' hourly observations, I have determined for each month the hour of the greatest (*maximum maximorum*) and of the least (*minimum minimorum*) velocity of the wind. Assuming that these hours belong to the middle of the month, I have united by a periodic formula the hours of maximum and those of minimum, and have thus obtained the two following formulæ :—

$$\begin{aligned}\text{Max. maximorum} = {} & 8^h\cdot08 + 3^h\cdot777 \tan (112°5'\cdot0 + M) \\ & + 2\cdot677 \tan (66°12'\cdot7 + 2M) \\ & + 1\cdot018 \tan (54°35'\cdot6 + 3M) \\ \text{Min. minimorum} = {} & -2\cdot50 + 3\cdot541 \tan (94°32'\cdot1 + M) \\ & + 1\cdot872 \tan (87°33'\cdot0 + 2M) \\ & + 1\cdot410 \tan (90°\ 0'\cdot0 + 3M)\end{aligned}$$

In the latter formula the negative hours are those which have to be subtracted from 24, for example $-2\cdot5 = 21\cdot5^h$.

These two formulæ give calculated values sufficiently near to the observed values, especially for the min. minimorum.

| | Maximum maximorum. | | | Minimum minimorum. | | |
|---|---|---|---|---|---|---|
| | Calculated. | Observed. | Difference. | Calculated. | Observed. | Difference. |
| January..... | 14h·8 | 13·0 | +1·8 | +3·5 | +4·0 | —0·5 |
| February ... | 10 ·5 | 13·0 | —2·5 | —1·1 | —2·0 | +0·9 |
| March ..... | 5 ·0 | 3·0 | +2·0 | —4·4 | —4·0 | —0·4 |
| April ..... | 3 ·3 | 4·0 | —0·7 | —4·3 | —4·0 | —0·3 |
| May ..... | 4 ·5 | 5·0 | —0·5 | —4·3 | —5·0 | +0·7 |
| June ..... ... | 5 ·7 | 5·0 | +0·7 | —5·4 | —5·0 | —0·4 |
| July ..... | 6 ·7 | 7·0 | —0·3 | —5·2 | —5·0 | —0·2 |
| August ..... | 7 ·9 | 8·0 | —0·1 | —3·7 | —4·0 | +0·3 |
| September... | 8 ·0 | 8·0 | 0·0 | —3·7 | —4·0 | +0·3 |
| October ..... | 7 ·5 | 7·0 | +0·5 | —4·0 | —3·0 | —1·0 |
| November ... | 9 ·5 | 10·0 | —0·5 | —0·9 | —2·0 | +1·1 |
| December ... | 13 ·6 | 14·0 | —0·4 | +3·6 | +4·0 | —0·4 |

The accompanying curves show instantly that their course is sensibly parallel. In order to form a true judgment respecting the argument, I have formed the *schema* of the differences, and by the method of inflexions have obtained the following values for the instants of the maxima and minima of the two curves. It is evident that the maxima M of the curves indicate that the hours approach noon, and the minima m midnight.

Here are the maxima and minima expressed in days of the civil year.

| Curve of the max. maximorum. | Curve of the min. minimorum. |
|---|---|
| M 94·0 | 72·0 |
| m 159·9 | 127·7 |
| M 192·7 | 180·7 |
| m 232·7 | 235·9 |
| M 297·8 | 293·6 |
| m 374·4 | 365·2 |

For the lower half the figures are sufficiently accordant; for the upper half the differences are sensible, and especially for the 22 days of the first M from March 13 to April 4, the 32 days for the first m from May 8 to June 9, and the 12 days for the second M from June 30 to July 12. However, it is probable that these differences are solely due to the limited series of observations, and to the difficulty of the comparisons.

Taking the mean of these dates we obtain—

| | |
|---|---|
| M 83 or March 24 | m 234 or August 22 |
| m 144 or May 24 | M 296 or October 23 |
| M 187 or July 6 | m 370 or January 5 |

Having obtained these values, one is struck by the close resemblance which they bear to those denoting the annual frequence of N.W. winds, which are—

| | | |
|---|---|---|
| m 75 | m 191 | m 295 |
| M 135 | M 239 | M 369 |

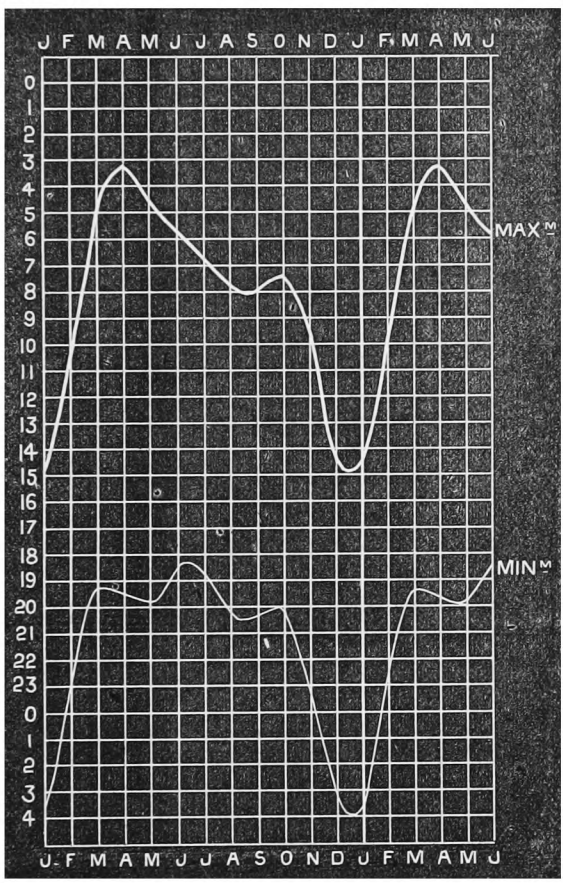
Then in all the epochs of minimum frequency of N.W. wind, the times of the extreme maximum and of the extreme minimum velocity approach towards noon, while they tend in the contrary direction at the epochs of maximum frequency of N.W. wind.

Although it is at present impossible to appreciate the whole import

of these curious accordances, because many intermediate links in the chain are still wanting, it must not be forgotten that at Modena the annual prevalence of N.W. wind is intimately related to the barometric fluctuations.

D. RAGONA.

*Modena, October 18th.*




## REMARKABLE SUNSET.

*To the Editor of the Meteorological Magazine.*

DEAR SIR,—Our English sunset skies, though well meant, are usually, such tame performances that the transcendently beautiful sunset of December 9th, as seen in South Leicestershire, certainly deserves record—I would have said full description, but that task is beyond the power of my pen.

The several preceding as well as succeding days were generally marked by fine weather, by mild W. and W.N.W. winds, by red sunrises as well as sunsets, by a good deal of "Noah's Ark," and of

other forms of upper cloud, in bands from N.W. to S.E. points, by solar and lunar halos, but without parhelia, and by the unusually vivid colouring of the coronæ formed by the passage of the thin lower stratus across the moon.

The sun rose on the morning of December 9th amid much reticulated cirrus. The canopy became steadily thicker, and by one p.m. had assumed the rather uncommon form of well-developed pocky sheet cirrus ("Mammato cirro-stratus.") the under surface of the canopy of cloud hanging in numberless sacs, or rounded protuberances, which were borne along by a brisk W.N.W. current over a sluggish W.S.W. breeze; the sky becoming increasingly gloomy. Before three p.m., however, a change took place, the whole sheet descending in the atmosphere, and becoming a form of high stratus, separate (as was shown by a gap in the canopy) from the, now thin, cirrus above. This canopy appeared as a bed of stratus, containing thousands of minute inverted and imbedded cumuli, arranged with some regularity ("Mammato stratus"). The regularity of arrangement gradually became more marked, and half-an-hour before sunset the sky was very strange-looking, the whole ceiling of cloud suggesting the idea of a perfect organic structure. Exceedingly long and narrow parallel fibres extended from W.S.W to E.N.E., throwing out curved lateral branches, like the fronds of immense ferns, these lateral branches being clustered all over with rows of minute pendent swellings. No gaps could now be seen in the canopy, but in the N.W. and S.W. it terminated in broken fragments of high cumulo-stratus, the sky clearing in that direction. I stood looking at this remarkable spectacle, wondering whether the physicist were yet born who, gazing on such a cloud structure, could fully describe the causes and method of its formation, when my attention was for the time called to other matters.

When I next took an observation, the sun, itself hidden by a little low scud in the S.W, was just setting, and the illumination of the under surface of the cloud-bank was extremely magnificent. The fibres above described were of a deep salmon colour; the small protuberances of a brilliant lake; while their interspaces were of a splendid indigo blue. The little fragments of cumulo-stratus in the W. and N.W., grotesquely-shaped and innumerable, but arranged in rows, were of a deep red colour, recalling those "fierce, fiery, warriors, in ranks and squadrons, and right form of war, which drizzled blood upon the Capitol"; though, I should add, neither the phenomenon of red rain, nor any other unusual occurrence, succeeded the manifestation about which I have written.

Is there no artist possessed both of patience to study, and of power to represent, a complex cloud-structure, like that which gave us the wonderful sunset effects of December 9th?—Yours truly,

H. CLEMENT LEY,

*Ashby Parva, Lutterworth, December 13th*, 1880.

## THE METEOROLOGICAL SOCIETY.

THE opening meeting of the Session was held on Wednesday evening, the 17th instant, at the Institution of Civil Engineers; G. J. Symons, F.R.S., President, in the chair. The following gentlemen were elected Fellows :—G. Corden, E. T. Dowson, F. Hepburn, B.A., C. M. Hepworth, J. Mulvany, M.D., R.N., T. H. G. Newton, Capt. M. Parry, E. P. Phillips, and H. L. Roth.

The papers read were :—1. "Table of Relative Humidity," by Edward E. Dymond, F.M.S. ; 2. "Rainfall in South Africa," by John G. Gamble, M.A., M. Inst. C.E., F.M.S. The author gives the monthly totals of rainfall from 103 stations for the thirteen months —December, 1878, to December, 1879,—and also the monthly means from all stations in South Africa from which a record of five years or upwards could be obtained. It is shown that the Cape Peninsula, the South West, and the West coast have winter rains with a dry summer, characteristics of what is called the subtropical region, the rains coming with the N.W. wind or anti-trade ; while Natal, Aliwal North, and in a less degree Queenstown, have the tropical features of a wet summer and dry winter.

On the South coast the rainfall appears to be more equally distributed throughout the year, though there seems to be an October maximum at Port Elizabeth and Uitenhage.

In the Central and Northern Karroo the maximum of the very scanty rainfall occurs in February and March. These rains generally fall in thunderstorms, each storm seems to come from a Westerly direction ; but it is a more or less well ascertained fact that these rains do not fall up country until the South Easters have set in on the South and South-West coasts.

In the South-East of the Colony the transition towards tropical features may be noticed, both Grahamstown and Kingwilliamstown, shewing a winter minimum in June.

3. "On the Meteorology of Mackay, Queensland," by Henry L. Roth.

4. "Thermometrical Observations on board ship," by Capt. W. F. Caborne, F.M.S.

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## REVIEW.

*Observations made at the Magnetical and Meteorological Observatory at Batavia.* Published by order of the Government of Netherlands, India. Vol. IV., large 4to, 217 pages. Government Printing Office, Batavia, 1879.

DR. BERGSMA is keeping to the high standard at which he started, and which we have already described in these pages.*

We pick out and convert into English values a few of the chief meteorological data for the Batavia Observatory in this handsome volume.

* See *Met. Mag.*, Vol. VII. (1872), p. 145, and Vol. XIV. (1879), p. 143.

*Barometric Pressure at 32° and Sea Level :—*

| | |
|---|---|
| Mean pressure, 1866–78 .. ... ... ... ... | 29·896 in. |
| Greatest pressure, 1877, July 25th, at 10 p.m. ... | 30·102 in. |
| Least pressure, 1870, Dec. 21st, at 3 p.m. ... ... | 29 672 in. |
| Total range in 13 years ... ... ... ... ... | 0·430 in. |
| Mean daily range ... ... ... ... ... ... | 0·108 in. |

(It is probably rather greater even than 0·108, as that is the difference between the means at 9 a.m. and 4 p.m., and neither the max. nor the min. occurs precisely at the hour).

*Temperature :—*

| | |
|---|---|
| Mean, 1866–78 .. ... ... ... ... | 78°·7 |
| Mean of hottest month (May) ... ... ... | 79°·6 |
| Mean of coldest month (January) ... ... ... | 77°·5 |
| Absolute maximum, 1877, Nov. 6th, 1 p.m. ... | 96°·1 |
| Absolute minimum, 1877, Sept. 9th, 6 a.m. ... | 66°·0 |
| Total range in 13 years ... ... ... ... | 30°·1 |
| Mean daily range ... ... ... ... ... | 10°·8 |

*Relative Humidity :—*

| | |
|---|---|
| Mean, 1866–78 ... ... ... ... ... | 83 |
| Mean of wettest month (February) ... ... | 88 |
| Mean of driest month, (July) ... ... ... | 78 |
| Absolute maximum (several times) ... ... | 100 |
| Absolute minimum (1877, Sept. 25th, at 1 p.m.) | 26 |

*Rain (33 ft. above ground) :—*

| | |
|---|---|
| Mean, 1864–78 ... ... ... ... ... ... | 75·91 in. |
| Wettest year (1872) ... ... ... ... ... | 98·59 in. |
| Driest year (1868) ... ... ... ... ... | 54·21 in. |
| Mean wettest month (January) ... ... ... | 15·91 in. |
| Mean driest month (August) ... ... ... ... | 1·89 in. |
| Absolute wettest month (January, 1872) ... ... | 33·78 in. |
| Absolute driest month (August to October, 1877) ... | 0·00 in. |
| Greatest fall in one day (May 15th, 1866) ... ... | 6·93 in. |
| Greatest fall in one hour (1867, January 10th, 2 a.m.) | 3·64 in. |

Dr. Bergsma does everything well, and his work is remarkably accurate. We do not remember detecting a single misprint among the millions of figures in his printed volumes. But we have two matters to bring to his notice :—

(1) The necessity of immediately establishing (if it be not already done) a second rain gauge at Batavia Observatory at or near the ground level. The roof one should continue to be observed, but a ground one is indispensable.

(2) Why print pages 38 to 73 inclusive ? They give the hourly readings of the standard thermometer, and the following 36 pages give the hourly readings of the dry bulb thermometer, and the two generally agree within a tenth of a degree. Surely the printing of the 90,000 figures on pages 38 to 73 is waste of time, of money, and of space.

Dr. Bergsma's excellent volume on the rainfall of the East Indian Archipelago we have put aside for notice in the next volume of *British Rainfall.*

# SUPPLEMENTARY TABLE OF RAINFALL IN NOV., 1880.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 3·47 | XI. | Corwen, Rhug ..... | 5·43 |
| ,, | Margate, Acol ..... | 3·80 | ,, | Port Madoc ..... | 7·58 |
| ,, | Littlehampton ..... | 4·27 | ,, | Douglas..... | 5·03 |
| ,, | St. Leonards ..... | 4·78 | XII. | Carsphairn ... ..... | 7·04 |
| ,, | Hailsham ..... | 4·11 | ,, | Melrose, Abbey Gate... | 4·81 |
| ,, | I. of W., St. Lawrence. | 5·25 | XIV. | Glasgow, Queen's Park. | 5·52 |
| ,, | Alton, Ashdell..... | 3·09 | XV. | Islay, Gruinart School.. | 6·46 |
| III. | Great Missenden ..... | 3·24 | XVI. | Cupar, Kemback..... | 3·68 |
| ,, | Winslow, Addington ... | 2·29 | ,, | Aberfeldy H.R.S. ..... | 4·98 |
| ,, | Oxford, Magdalen Col... | 1·99 | XVII. | Tomintoul..... | 3·91 |
| ,, | Northampton ..... | 2·03 | ,, | Keith H.R.S. ..... ..... | 3·67 |
| ,, | Cambridge, Merton Vil. | 1·90 | ,, | Forres H.R.S. ..... ... | 3·62 |
| IV. | Harlow, Sheering ..... | 2·18 | XVIII. | Strome Ferry H.R.S.... | 8·71 |
| ,, | Diss ..... | 2·40 | ,, | Auchnasheen H.R.S. ... | ... |
| ,, | Swaffham ..... | 2·11 | ,, | Lochbroom ..... | 8·04 |
| ,, | Hindringham ..... | 2·49 | ,, | Tain, Springfield..... | 2·38 |
| V. | Salisbury, Alderbury... | 2·57 | ,, | Loch Shiel, Glenfinnan. | 16·01 |
| ,, | Calne, Compton Bassett | 2·92 | ,, | Dalwhinnie H.R.S..... | ... |
| ,, | Beaminster Vicarage ... | 5·53 | XIX. | Lairg H.R.S. ..... | 1·59 |
| ,, | Dartmoor, Princetown.. | 10·08 | ,, | Altnabreac H.R.S. ..... | ... |
| ,, | Langtree Wick ..... | ... | ,, | Watten H.R.S. ..... | 3·15 |
| ,, | Lynmouth, Glenthorne. | 5·55 | XX. | Fermoy, Glenville ..... | 5·72 |
| ,, | St. Austell, Cosgarne... | 4·52 | ,, | Tralee, Castlemorris ... | 4·39 |
| ,, | Taunton ..... | 2·54 | ,, | Cahir, Tubrid ..... | 3·93 |
| VI. | Bristol, Ashleydown ... | 3·09 | ,, | Tipperary, Henry St.... | 3·28 |
| ,, | Ross ..... | 2·97 | ,, | Newcastle West ..... | ... |
| ,, | Wem, Sansaw Hall..... | 2·81 | ,, | Kilrush ..... | 4·63 |
| ,, | Cheadle, The Heath Ho. | 3·01 | ,, | Corofin ..... | 6·08 |
| ,, | Bickenhill Vicarage .. | 1·92 | XXI. | Kilkenny, Butler House | 3·42 |
| VII. | Melton, Coston ..... | 1·57 | ,, | Carlow, Browne's Hill.. | 3·23 |
| ,, | Horncastle, Bucknall ... | 2·12 | ,, | Kilsallaghan..... | 3·48 |
| VIII. | Walton-on-the-Hill..... | 3·88 | ,, | Navan, Balrath ..... | 3·61 |
| ,, | Broughton-in-Furness .. | 7·20 | ,, | Athlone, Twyford ..... | 5·07 |
| IX. | Wakefield, Stanley Vic. | 1·86 | ,, | Mullingar, Belvedere ... | 5·22 |
| ,, | Ripon, Mickley ..... | 3·35 | XXII. | Ballinasloe ..... | 5·30 |
| ,, | Scarborough..... | 2·31 | ,, | Clifden, Kylemore ..... | 10·98 |
| X. | Mickleton..... | 3·53 | ,, | Crossmolina, Enniscoe.. | 9·07 |
| ,, | Haltwhistle, Unthank.. | 4·21 | ,, | Carrick-on-Shannon ... | 4·85 |
| ,, | Shap, Copy Hill ..... | 10·88 | XXIII. | Dowra ..... | 4·76 |
| XI. | Llanfrechfa Grange ..... | 5·85 | ,, | Rockcorry..... | 3·99 |
| ,, | Llandovery ..... | 6·60 | ,, | Warrenpoint ..... | 3·60 |
| ,, | Solva ..... | 2·98 | ,, | Newtownards ..... | 2·73 |
| ,, | Castle Malgwyn ..... | 6·24 | ,, | Carnlough..... | 5·62 |
| ,, | Rhayader, Nantgwillt.. | 7·98 | ,, | Bushmills ..... ..... | 3·73 |
| ,, | Carno, Tybritle ..... | 6·26 | ,, | Buncrana ..... | 5·59 |

# NOVEMBER, 1880.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1860–5 | Greatest Fall in 24 hours. Dpth | Greatest Fall in 24 hours. Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Max. Date. | Min. Deg. | Min. Date. | No. of Nights below 32°. In shade. | No. of Nights below 32°. On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | Camden Square | 1·85 | — ·56 | ·54 | 15 | 13 | 58·0 | 13 | 24·6 | 22 | 12 | 18 |
| II. | | Maidstone (Hunton Court) | 3·19 | + ·16 | ·99 | 18 | 14 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss | 2·08 | ... | ·41 | 14 | 15 | 57·1 | 13 | 21·5 | 22 | 11 | 19 |
| III. | | Hitchen | 2·36 | + ·22 | ·66 | 15 | 12 | 55·0 | 13 | 20·0 | 21 | 13 | ... |
| ,, | | Banbury | 2·06 | — ·14 | ·71 | 15 | 13 | 57·0 | 13* | 19·0 | 22 | 13 | ... |
| IV. | | Bury St. Edmunds (Culford) | 2·05 | — ·34 | ·57 | 15 | 14 | 58·0 | 13 | 20·0 | 21 | 11 | ... |
| ,, | | Norwich (Cossey) | 1·95 | — ·60 | ·37 | 18 | 19 | 59·5 | 13 | 24·5 | 23 | 14 | 14 |
| V. | | Bridport | 3·94 | + ·78 | 1·35 | 18 | 15 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple | 3·89 | — ·25 | ·64 | 15 | 18 | 58·0 | 14† | 25·0 | 22 | ... | ... |
| ,, | | Bodmin | 4·29 | — ·69 | ·73 | 15 | 19 | 56·0 | 14 | 29·0 | 22 | 6 | 10 |
| VI. | | Cirencester | 3·05 | + ·26 | ·83 | 15 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | | Shifnal (Haughton Hall) | 1·87 | + ·30 | ·71 | 14 | 15 | 59·0 | 13 | 18·5 | 21 | 12 | 15 |
| ,, | | Tenbury (Orleton) | 2·17 | — ·30 | ·60 | 15 | 17 | 59·5 | 13 | 17·8 | 21 | 12 | 14 |
| VII. | | Leicester (Town Museum) | 1·67 | ... | ·47 | 15 | 14 | 61·0 | 13 | 13·3 | 22 | 13 | 24 |
| ,, | | Boston | 1·94 | — ·20 | ·48 | 14 | 14 | 60·0 | 14 | 25·0 | 23 | 12 | ... |
| ,, | | Grimsby (Killingholme) | 2·86 | ... | ·61 | 14 | 19 | 58·0 | 13 | 27·0 | 23 | 6 | ... |
| ,, | | Mansfield | 2·91 | ... | 1·28 | 14 | 16 | 58·5 | 13 | 20·8 | 21 | 13 | 17 |
| VIII. | | Manchester (Ardwick) | 3·63 | + 1·00 | ·79 | 14 | 18 | 59·0 | 13 | 21·0 | 23 | 10 | ... |
| IX. | | York | 2·49 | + ·51 | ·75 | 17 | 12 | 61·0 | 13 | 19·0 | 21 | 12 | 16 |
| ,, | | Skipton (Arncliffe) | 9·78 | + 3·33 | 2·55 | 13 | 25 | 57·0 | 13 | 17·0 | 20 | ... | ... |
| X. | | North Shields | 2·32 | — ·38 | ·42 | 15 | 19 | 60·0 | 13 | 18·5 | 21 | 11 | 13 |
| ,, | | Borrowdale (Seathwaite) | 22·70 | + 6·03 | 4·75 | 13 | 21 | ... | ... | ... | ... | .. | ... |
| XI. | WALES. | Cardiff | 3·67 | ... | ·90 | 15 | 14 | 57·3 | 14 | 25·8 | 22 | 9 | ... |
| ,, | | Haverfordwest | 5·58 | — ·09 | 1·07 | 15 | 17 | 56·0 | 14 | 22·5 | 20 | 8 | 14 |
| ,, | | Aberdovey | 4·95 | ... | 1·21 | 15 | 18 | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno | 4·28 | + 1·12 | ·70 | 16 | 16 | 57·3 | 13 | 25·7 | 22 | 7 | ... |
| XII. | | Cargen | 5·79 | + 2·00 | 1·00 | 24 | 20 | 59·2 | 13 | 16·0 | 21 | 14 | ... |
| ,, | | Hawick (Silverbut Hall) | 4·59 | ... | 1·02 | 14 | 17 | ... | ... | ... | ... | ... | ... |
| XIV. | | Douglas Castle (Newmains) | 8·76 | ... | 1·05 | 13 | 23 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Long (Arddaroch) | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Kilmory | 7·47 | ... | ·91 | 12 | 20 | ... | ... | 16·0 | 20 | 14 | ... |
| ,, | | Mull (Quinish) | 6·78 | ... | 1·01 | 30 | 22 | .. | ... | ... | ... | ... | ... |
| ,, | | Loch Leven | 4·30 | + ·65 | ·60 | 14 | 17 | ... | ... | ... | ... | ... | ... |
| XVII. | | Arbroath | 2·71 | — ·18 | ·48 | 16 | 14 | 57·0 | 13 | 16·0 | 21 | 13 | ... |
| ,, | | Braemar | 4·42 | + 1·60 | 1·03 | 26 | 19 | 51·9 | 6 | 16·0 | 20 | 15 | 24 |
| XVIII | | Aberdeen | 2·58 | ... | ·43 | 12 | 21 | 56·0 | 11 | 15·0 | 20 | 13 | ... |
| ,, | | Portree | 9·71 | — ·77 | 1·53 | 30 | 23 | ... | ... | ... | ... | ... | ... |
| ,, | | Inverness (Culloden) | 3·17 | + ·58 | ... | ... | .. | 55·8 | 6 | 14·8 | 21 | 13 | 20 |
| XIX. | | Dunrobin | 3·06 | + ·75 | ·80 | 30 | 20 | 56·0 | 6 | 21·0 | 15¶ | 14 | ... |
| ,, | | Sandwick | 4·28 | + ·28 | ·62 | 12 | 25 | 53·1 | 6 | 27·0 | 15 | 10 | 15 |
| XX. | | Cork (Blackrock) | 5·72 | ... | 1·34 | 22 | 19 | 59·0 | 11‡ | 22·0 | 3 | 11 | ... |
| ,, | | Darrynane Abbey | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | IRELAND. | Waterford | 4·12 | + ·17 | ·56 | 15 | 22 | 55·5 | 7, 13 | 27·0 | 9, 18 | 11 | ... |
| ,, | | Killaloe | 6·09 | + 1·20 | 1·16 | 13 | 17 | 58·0 | 12 | 26·0 | 9** | 10 | ... |
| XXI. | | Portarlington | 3·34 | — ·58 | ·66 | 15 | 22 | 57·5 | ... | 26·0 | 3 | 13 | ... |
| ,, | | Monkstown | 3·16 | + ·27 | ·70 | 15 | 18 | .. | ... | ... | ... | ... | ... |
| XXII. | | Galway | 6·55 | ... | 1·40 | 12 | 20 | 55·0 | 14§ | 25·0 | 20 | 8 | ... |
| XXIII | | Waringstown | 3·16 | ... | ·55 | 15 | 22 | 59·0 | 13 | 18·0 | 19 | 11 | 14 |
| ,, | | Londonderry | 5·55 | ... | 1·58 | 13 | 24 | 56·0 | 12 | 22·5 | 20 | 5 | 14 |
| ,, | | Edenfel (Omagh) | 4·85 | ... | 1·20 | 13 | 22 | 56·0 | 13 | 14·0 | 19++ | 17 | ... |

* And 14. † And 15. ‡ And 13. § And 29. ¶ And 21. ** And 15, 20. †† And 20.

+ Shows that the fall was above the average; — that it was below it.

# METEOROLOGICAL NOTES ON NOVEMBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—Weather variable; sowing has been actively progressing, much wheat and many vetches being put in well. Sheep doing well; abundance of grass.

BANBURY.—High wind on 8th, 11th, 16th, 18th, and 27th. S on 15th, 17th, and 18th. Fine pale aurora on 3rd.

CULFORD.—Unusually severe frost for the time of year, and being followed by high winds, the trees were stripped of their leaves with remarkable rapidity.

NORWICH.—Max. temp. on the 22nd, 35°. Aurora on 3rd.

BODMIN.—The oscillations of the bar. between the 11th and 28th were very remarkable. Mean temp., 46°·2.

CIRENCESTER.—A few very sharp frosts, but not of long continuance; mild and pleasant afterwards; S on the 22nd.

SHIFNAL.—Another month of great and sudden changes of temp. Very cold till the 6th, then warm till 14th; min. temp. on night of 13th, 52°; severe frosts on 2nd and 21st, ice 2 in. thick on the latter day. Strong winds from S.W. on 9th and 13th, and from N.W. on 19th; unusually low bar. on 16th. Remarkable freedom from fog. A great paucity of woodcock; no fieldfares seen yet.

ORLETON.—The temp. of the month was very variable, but the mean was only half a degree below the average. The first five days were very cold, the temp. falling to 19°·8 on the morning of the 3rd; from the 9th to the 18th it was warm, with R or S daily. At noon on the 15th a sudden fall of S commenced, which covered the ground to a depth of 2 inches before 5 p.m., but it all disappeared in the night. The river Teme overflowed on the 16th; and on the 17th the flood on the Severn was higher than that of October last. From the 17th to the 24th the cold was again severe, the min. of the 21st being 17°·8, followed by a great fog. The remainder of the month was warm and pleasant; the fluctuations of the bar. were great and sudden.

LEICESTER.—S on 15th and 21st.

KILLINGHOLME.—Opening and close of month fine, middle wet and very unsettled; very little fog. Two inches of S on 18th.

MANSFIELD.—Rainfall about the average; S on 15th, 18th, and 21st.

MANCHESTER.—The month opened with seasonable weather, cold and bracing, but it soon changed to wet, with a considerable rise in temp. Frost set in again on 19th, but gave way to R on 23rd, with a higher temp., and so the month closed.

ARNCLIFFE.—Sudden and great falls of bar. frequent, but not always followed by corresponding changes in the weather; night of the 12th very wild and rough.

NORTH SHIELDS.—S on 17th, 19th, 21st, 22nd, and 23rd. Aurora on 3rd.

SEATHWAITE.—A very stormy month. A terrible storm on the 13th, with 4·75 in. of R; 4·17 in. also fell on the 12th, and 3·37 in. on the 28th. There were two other falls exceeding 1 in.

## WALES.

HAVERFORDWEST.—The very cold weather of October was prolonged into November, with high pressure and easterly wind; from the 10th to the 16th was a very stormy period, with much R. A very deep depression passed on the 16th, accompanied by R and H. A sudden change took place on the 18th; S fell, the air became very wintry, and the frost continued so intense that, in some places, skating was indulged in on the 21st. From the 23rd to the end

of the month it was much milder, very wet, and very stormy; a continuous gale, especially at night, from 24th to 29th.

ABERDOVEY.—Severe hailstorm on 23rd.

LLANDUDNO.—Although the mean temp. of the month was but slightly below the average, the weather was very variable; from the 1st to the 5th it was cold but calm, from the 14th to the 21st it was cold and stormy. The rainfall was about 25 per cent. above the average.

## SCOTLAND.

CARGEN.—A very stormy month; the fluctuations of the bar. and ther. were frequent and unusually rapid. S on 16th and 17th. Mean temp. 41°·1, 0°·1 below the average.

HAWICK.—Mild up to the 10th. Terrible storm of R, S, and H on the 13th and 14th; very severe frost on the 20th, but vegetables, &c. were protected by the S, which was 6 inches deep.

NEWMAINS.—S daily from 15th to 19th; total depth, 14 inches.

KILMORY.—Very sharp frost from 18th to 20th.

ABERDEEN.—Up to the 20th the prevailing winds were W. to N.W., with low night temperatures and S showers during the day; from the 21st to the end of the month the wind was southerly to south-westerly, with higher temperatures and gales. Rainfall slightly below the average. Aurora on three nights. Strong gale on 26th, the wind reaching force 10.

PORTREE.—S and hard frost prevailed from 15th to 22nd. Gale on 24th, with heavy H showers. L at night on 24th and 25th. Gale from S. all day on 26th.

CULLODEN.—Weather stormy for November; from 15th to 25th heavy S storms, with intense frost. The temp. on ground fell to 3° on the 21st, the lowest reading recorded during 40 years' consecutive observations, with the exception of Feb. 22nd, 1855, when the temp. fell to 1°. S so heavy (11½ in.) and frost so intense so early as November is remarkable. The month closed with very boisterous weather. Slight shock of earthquake at 6 p.m. on 28th.

SANDWICK.—A cold blustery month. Temp. 1°·6 below the mean, and rainfall and wind above it. The ground was white with S on the 8th, and again on the 14th, when a S storm began which lasted for six days, followed by alternate frosts and thaws till the plains were cleared of S on the 24th. Gale of 50 miles an hour on 26th from 6 p m. to midnight. T and L at 6 a.m. on 27th. Aurora on five nights.

## IRELAND.

CORK.—Winds strong at times, but no heavy gales.

WATERFORD.—Early part of month cold and misty; from 23rd to 30th very warm. Very high wind on 16th. Aurora on 3rd.

KILLALOE.—First week dry and frosty; heavy rainfall and high winds from 9th to 15th; dry and frosty again from 15th to 22nd, and the month closed with rising temp, dull heavy weather and daily R.

WARINGSTOWN.—Some very sharp frost; on the whole seasonable.

LONDONDERRY.—Weather mild up to the 17th, frosty from 17th to 22nd, very stormy from 24th to 28th; max. velocity of wind, about 56 miles per hour on morning of 26th. A slight shock of earthquake was felt on the 28th, about 5.25 p.m., passing from W. to E.

## RAINFALL RECORDS.

I venture to make one suggestion and one request.

The suggestion is that all persons who contemplate making rainfall observations commence on the first of January, so as to obtain a perfect record for 1881.

The request is, that any person who knows of any records not quoted in *British Rainfall*, 1879, will inform me of the fact.

G. J. SYMONS.

62, CAMDEN SQUARE, N.W., *Dec. 14th.*

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CLXXX.] JANUARY, 1881. [PRICE FOURPENCE. or 5s. per ann. post free.

## LONDON FOG.

(*Concluded from page* 163).

SINCE our last number the discussion, and printing, and talking about the Fog Question has been as vigorous as ever, and with the exception of one day (Sunday, January 2nd) fogs have been slight or *nil*. This shows plainly that we were right in affirming that fogs are not increasing in intensity, and it shows also that they are not proportional to the number of chimneys. We are no friends to smoke—far from it; but we see, or think that we see, a large amount of money profit being attempted to be made by stove-makers, and dealers in anthracite coals, and of cheap popular renown by others, and as far as lies in our power we wish to prevent our readers and the public being used as puppets.

That the London atmosphere could, and should, be kept cleaner than it is, no one would be so silly as to deny; and that if the existing law were enforced there would be a perceptible improvement we firmly believe.

The existing arrangement, whereby about half a cubic foot of coals is put in a recess in one side of a room, surrounded on three sides with brickwork, and with a shaft above it to carry off the heat, and much of the carbon, and supplied with air sucked along the floor over the feet of the occupants so as to cool them, is in nearly every respect so injudicious that no one can be astonished at there being a rebellion against so wasteful and inefficient a system.

But we protest against this question being pushed by exaggerated or untrue statements. The actual facts are strong enough, and though exaggeration may succeed temporarily it does not often do so permanently.

As to the precise causes of the formation of fog, a very remarkable paper appeared in *Nature* of December 30th, and, although we reserve our acceptance of the views enunciated, we think it of sufficient importance to direct attention to it. It is evident that much thought is being directed to the two separate questions—the cause of fog, and the best way of warming dwellings. No one could do otherwise than wish success to real investigators of both questions.

## REVIEWS.

*The Rosarian's Year Book for* 1881. Edited by the Rev. H. HONYWOOD D'OMBRAIN, Hon. Sec. of the National Rose Society. Sq. 8vo., vi.-82 pages. London : Bemrose and Sons. 1881.

WE do not presume to criticise this work in its principal features, but as the Rose-growing world is interesting itself very judiciously in tracing the relation between rose triumphs and climatic varieties, it would be ungracious not to offer a word of welcome and encouragement to its efforts.

As regards the Meteorological branch of this nicely got up little manual, we may draw special attention to Mr. G. Baker's paper "On the effect of Severe Winter on the Unripened Wood of the Rose," and to that on "The Weather of the Past Rose Year," by Mr. E. Mawley, F.M.S. and Hon. Sec. National Rose Society. There is a chatty paper on "The Rose of Poetry," by the Rev. Alan Cheales, in which we notice one or two little errors. The chief one is with reference to the inscription in the Chapter House of York Minster. Mr. Cheales says "An idea the York Cathedral chapter afterwards utilised in favour of their beautiful chapter house—

"Ut Rosa flos florum,
Sic Tu domus domorum."

Feeling sure that the above was incorrect, we turned to Drake's *Eboracum*, and there found the inscription given in what is beyond our printer—viz. Old Saxon—somewhat as follows :

UT ROSA PHLOS PHLORUM, SIC EST DOMUS ISTA DOMORUM.

Here are two or three puzzles, not at all meteorological, but which perhaps there is no harm in mentioning :—

(1). As the author knew Latin sufficiently to compose this, why was it not written in Roman letters.

(2). There was a true F in Saxon, why then spell Flos "Phlos."

Mr. Mawley is so extremely desirous of being correct, that he will not thank the printer for making him say that in October, 1879, "Only seventeen days were entirely free from fog, and between the "10th and 14th water was deposited in the funnel of my rain gauge "by heavy dews and fogs alone, to the most unusual depth of "0·3 inches." We do not believe that London has a monopoly of fogs, but neither do we believe that Croydon fogs could ever yield "0·3 inches in three days." Of course it should be 0·03 inch, and we merely mention it as a proof, for those who need it, that no amount of care will ensure absolute freedom from error.

We cannot better indicate the class of work which Mr. Mawley is devoting to the subject, or our appreciation of it, than by reprinting the concluding paragraphs of his paper :—

"It may not be inappropriate to offer in conclusion a few remarks upon what I conceive to have been the cause of the Hereford Roses cut from maiden plants occupying so prominent a position at the exhibitions of the present year, when,

generally speaking, those from most other localities were so far below their usual standard.

## RAINFALL AND TEMPERATURE FOR THE FOUR MONTHS ENDING JUNE 30, 1880.

| | Croydon. | Hereford. | *Difference |
|---|---|---|---|
| Mean of highest day temperatures ..... | 58°·6 | 57°·9 | 0°·7 *b* |
| Mean of lowest night temperatures ..... | 42°·0 | 41°·4 | 0°·6 *b* |
| Lowest night temperature registered ..... | 25°·8 | 26°·4 | 0°·6 *a* |
| Mean temperature of the 4 months ..... | 50°·3 | 49°·6 | 0°·7 *b* |
| Number of Frosts (Stevenson-screen) ..... | 9 | 9 | — |
| Total Rainfall ..... | 6·305 in. | 7·671 in. | 1·366 in. *a* |
| Heaviest in any one day..... | 0·663 in. | 1·173 in. | 0·510 in. *a* |
| Number of rainy days..... | 43 | 53 | 10 *a* |

* In this column *a* indicates Hereford above Croydon, *b* Hereford below Croydon.

"From the above table it will be seen that, though speaking generally, the weather at Hereford during this period was colder than that experienced in the neighbourhood of London, yet the greatest cold registered was rather less severe, and the number of frosty nights precisely the same in both districts. The sharpest frost of the previous winter appears to have been, moreover, equally as intense in Croydon as at Hereford. When, however, we turn our attention to the particulars relating to rainfall, we find that at Hereford the total of these four months exceeded that at Croydon by nearly 1½ inches, and that the number of rainy days was ten more in the former locality than in the latter. The last named differences are important themselves, considering the dryness of the spring months; but it is rather to the very different way in which the heavier falls were distributed at the two places, than to the aggregate amounts deposited at each, that I here wish more particularly to direct attention. In March rain fell at Croydon to amounts exceeding ·10 inch on only two days (2nd and 31st), but at Hereford on five days (1st, 2nd, 3rd, 9th, and 31st.) In April, at Croydon, on six days (2nd, 5th, 13th, 14th, 15th, and 19th), but at Hereford, on only four days (1st, 3rd, 4th, and 15th.) In May, at Croydon, on but one day, and that the last day of the month. In other words, between the 19th of April and the 31st of May, or for six weeks, there occurred no rain likely to have had any appreciable influence upon the growth of Rose-plants in a dry season. Indeed, from the 19th of April to the 15th of June, or for two months, no fall of rain amounting to a quarter of an inch in depth took place in this neighbourhood. At Hereford, on the other hand, the heavier falls in May were thus distributed:—·11 inch on the 3rd, ·17 inch on the 10th, 1·17 inches on the 26th, ·20 inch on the 27th, ·13 inch on the 28th, ·21 inch on the 30th, and ·16 inch on the 31st. There is no need for us to carry our investigation into June, as that month proved equally wet in both localities.

"To state the case more simply, just at that particular time in May, when I was entering this note in my journal, "Warm rain now greatly needed," it appears that rain was falling very heavily at Hereford for many consecutive hours, and I take it to have been this one day's fall more especially which turned the scale in favour of the Hereford plants, and tided them safely over the most critical period of their growth. And it has also occurred to me that the great depth of rich soil in the Hereford Rose-gardens, and its medium character, must afford the roots some permanent protection from extreme weather of all kinds. Though, doubtless, the two lighter falls of rain which took place earlier in the same month, and the colder weather experienced in the West of England during April, may also have been of service as helping to maintain a more uniform rate of progress than fell to the lot of Roses growing in many other

arts of the country, showing that we English Rosarians, however greatly we may pride ourselves upon our soil, our skill in culture and our climate, are, after all, very much at the mercy of the seasons as they come round."

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*Annali dell' Ufficio centrale di Meteorologia Italiana.* Serie II., Vol. I., 1879. 742 pp., 17 plates. Folio; Roma, 1880.

ON the occasion of the Congress of Sciences, held at Palermo in August, 1875, a Commission was appointed by the Italian Government for the discussion of a programme relative to the centralisation of the various meteorological services in Italy, a report of which is to be found in the supplement to the *Meteorologia Italiana* for 1875; and in the following year Senator Cantoni, of Padua, attended a meeting of the International Meteorological Committee in London, a full report of which he presented to his Government. In consequence of this report, and of the representations made by the Palermo Commission, the Italian Government, by a decree dated the 26th of November, 1876, nominated a Meteorological Council, consisting of eight members, the result of which was the establishment of a Central Meteorological Office for Italy, in August, 1877.

We have lately received from Prof. P. Tacchini, the Director of the Office and a member of the Council, representing the Ministry of Agriculture and Commerce, the above named first volume of its annals, for the year 1879. It is said to be Series II.; we presume that the first Series would be the *Meteorologia Italiana* which has been regularly published since 1865, under the superintendence of the Ministry of Agriculture.

This splendid volume has for its frontispiece an excellent portrait of the late Father Angelo Secchi (died 1878), well known as the former Director of the Meteorological Observatory of the Roman College, and first President of the Italian Meteorological Council. The introduction contains (1) a summary of the discussions at the meetings of the Council between March, 1877, and April, 1879, which gives much information respecting the details of the methods of observation, and the instruments used at the various stations. The fundamental system consists of 69 stations, situated at or near the principal cities, in addition to a large number of subordinate stations selected from local considerations. (2) An account of the observations in the interest of agriculture. These observations are taken at 38 stations, and the results, including daily extremes of temperature, rainfall, thunderstorms, &c., are published every ten days, and copies to the number of 2,500 are distributed to the various Chambers of Commerce, Agricultural Committees, &c. (3) An account of the telegraphic meteorological service. These reports are published in a daily bulletin, and contain, in addition to the observations from Italian stations, reports or *resumés* from London, Paris, and St. Petersburgh, and occasionally other notices, *e.g.* the warnings issued by the *New York Herald* Office.

The contents of the volume are divided into three principal parts, of which the following brief summary may give some idea.

Part I. is devoted to a series of interesting memoirs by vario authors. We may mention, *inter alia*, (*a*) an account of a remar able thunderstorm at Mantua, on the 25th July, 1878, accompani by a fall of salt hail, supposed to have been formed from se water, carried into the air by a waterspout; (*b*) a comparison results obtained by the use of Regnault's Hygrometer, and of t Dry and Wet-bulb thermometers, with an arrangement for aspiration. The author (Dr. Chistoni) states that the result of these experiments, which were continued for a whole year, gives reason to hope that a formula for psychrometrical observations will be eventually found which will give more satisfactory results, especially for low temperatures, and that this formula will form the object of a future study. Such a formula would be heartily welcomed by all meteorologists. We are glad to see from the Report of the Meteorological Council (London) for 1879-80, just issued, that hygrometrical investigations are being undertaken for the Meteorological Office by W. N. Shaw, M.A., of Cambridge, who has already presented a preliminary report upon this intricate and important subject. (*c*) A paper on the meteoric dust and other substances contained in a Scirocco storm, illustrated by coloured plates of microscopic specimens.

Part II. contains the observations printed *in extenso*, taken at 78 stations three times a day during the year 1879, together with 10-day, monthly, and annual means. Some of these stations are situated at great altitudes, the highest being at Valdobbia, about 8660 feet above sea-level. The publication of these observations, on the plan adopted by the International Meteorological Committee, is of the greatest importance for the science of meteorology, and, excepting perhaps the Russian system, is probably the most extensive network in existence.

Part III. gives a special description of the instruments in use at the Observatory of the Roman College, and contains the observations made there in 1879, together with monthly reviews and various astronomical observations. This series is intended to form a continuation of the observations published for many years by Father Secchi in the Meteorological Bulletin of the Roman College, and, in order to render the series complete, the results for the years 1877–78 have been added.

The production of this valuable addition to our meteorological knowledge, and in so short a time after the actual date of the observations, reflects great credit upon the Italian Central Office, and places Italy among the foremost of nations dealing with this important branch of physical science.—[J. S. HARDING.]

## THE METEOROLOGICAL SOCIETY.

THE usual monthly meeting of this Society was held on Wednesday, the 15th inst., at the Institution of Civil Engineers, Mr. G. J. Symons, F.R.S., President, in the chair. F. Coventry, J. W. Moore, M.D.,

W. T. Paulin, J. Porter, and Captain W. C. Smith were balloted for and elected Fellows.

The following papers were read:—(1) "Report on the Phenological Observations for the year 1880." By the Rev. T. A. Preston, M.A., F.M.S. Agriculturally speaking, the year may be considered as disappointing. Till June the weather was such as has rarely been experienced for farm operations. The severe cold of the winter broke up and mellowed the soil, and the dry open weather enabled farmers to clean their land from the excessive growth of weeds caused by the damp of the year before. The dry May was not favourable for the hay, which suffered severely in some places, but still a crop with far more real nourishment in it than would be obtained from a rank growth would have been secured had it not been for the terrible floods of July in the midland counties, which not only seriously injured the crop, so that it was frequently not worth the trouble of removing off the land, but also carried it entirely away in low-lying districts. The corn, again, which was looking most promising till July, suffered much during that damp period, and had it not been for the subsequent fine weather would have been ruined. But the unfavourable season of 1879 produced very serious effects on vegetation, especially on trees and shrubs, and their produce. The young wood of the trees was not ripened, and as a natural consequence the severe winter killed an enormous quantity of some kinds, and greatly injured others. "Laurustinus" was generally killed to the ground, and in some districts the destruction of other shrubs was severely felt. The evergreens in many cases lost large quantities of their leaves—hollies especially are mentioned by several observers, and privet hedges were sometimes quite leafless. With respect to fruit trees, apples and pears in some localities (but not all) were hardly able to put forth any bloom, and the crops were consequently extremely poor. Wall fruit was also a general failure, but this was partially owing to severe weather when the trees were in bloom, for in some instances the show of bloom was splendid. Gooseberries and currants produced enormous crops, and strawberries were very fine, but they lasted an unusually short time. Seeds generally ripened with difficulty; much of the corn could not be ground, and a great deal was mixed up with roughly ground Indian corn, and flavoured to induce the cattle to eat it. The crop of ordinary garden seeds was also far below its usual quality, and some of the favourite garden flowers were consequently very poor.

(2) "On the Variations of Relative Humidity and Thermometric Dryness of the Air, with changes of Barometric Pressure at the Kew Observatory." By G. M. Whipple, B.Sc., F.R.A.S., F.M.S.

(3) "On the Relative frequency of given heights of the Barometer Readings at the Kew Observatory during the ten years, 1870–79." By G. M. Whipple, B.Sc., F.R.A.S., F.M.S.

# SUPPLEMENTARY TABLE OF RAINFALL IN DEC., 1880.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div. | STATION. | Total Rain. | Div. | STATION. | Total Rain. |
|---|---|---|---|---|---|
| | | in. | | | in. |
| II. | Dorking, Abinger ..... | 3·76 | XI. | Corwen, Rhug ..... | 5·18 |
| ,, | Margate, Acol ..... | 2·91 | ,, | Port Madoc ..... | 9·02 |
| ,, | Littlehampton ..... | 4·28 | ,, | Douglas..... | 3·94 |
| ,, | St. Leonards ..... | 5·00 | XII. | Carsphairn ... ..... | 4·69 |
| ,, | Hailsham ..... | 4·64 | ,, | Melrose, Abbey Gate... | 3·34 |
| ,, | I. of W., St. Lawrence. | 5·28 | XIV. | Glasgow, Queen's Park. | 3·60 |
| ,, | Alton, Ashdell..... | 3·78 | XV. | Islay, Gruinart School.. | 6·07 |
| III. | Great Missenden..... | 3·63 | XVI. | Cupar, Kemback..... | 2·16 |
| ,, | Winslow, Addington ... | 2·51 | ,, | Aberfeldy H.R.S. ..... | ... |
| ,, | Oxford, Magdalen Col... | 3·10 | XVII. | Tomintoul..... | 2.10 |
| ,, | Northampton ..... | 2·87 | ,, | Keith H.R.S. ..... ..... | 3·01 |
| ,, | Cambridge, Merton Vil. | 2·38 | ,, | Forres H.R.S. ..... ... | 3·01 |
| IV. | Harlow, Sheering ..... | 2·83 | XVIII. | Strome Ferry H.R.S.... | 5·00 |
| ,, | Diss ..... | 2·82 | ,, | Auchnasheen H.R.S. ... | ... |
| ,, | Swaffham ..... | 3·04 | ,, | Lochbroom ..... | 6·76 |
| ,, | Hindringham ..... | 2·68 | ,, | Tain, Springfield..... | 2·10 |
| V. | Salisbury, Alderbury... | 3·68 | ,, | Loch Shiel, Glenfinnan. | 11·00 |
| ,, | Calne, Compton Bassett | 3·52 | ,, | Dalwhinnie H.R.S..... | ... |
| ,, | Beaminster Vicarage ... | 6·27 | XIX. | Lairg H.R.S. ..... | ... |
| ,, | Dartmoor, Princetown.. | ... | ,, | Altnabreac H.R.S. ..... | ... |
| ,, | Langtree Wick ..... | 6·93 | ,, | Watten H.R.S. ..... | 5·08 |
| ,, | Lynmouth, Glenthorne. | 7·34 | XX. | Fermoy, Glenville ..... | 3·83 |
| ,, | St. Austell, Cosgarne... | 6·50 | ,, | Tralee, Castlemorris ... | 4·19 |
| ,, | Taunton ..... | ... | ,, | Cahir, Tubrid ..... | 3·26 |
| VI. | Bristol, Ashleydown ... | 5·17 | ,, | Tipperary, Henry St.... | 4·74 |
| ,, | Ross ..... | 3·35 | ,, | Newcastle West ..... | ... |
| ,, | Wem, Sansaw Hall..... | 3·70 | ,, | Kilrush ..... | 3·89 |
| ,, | Cheadle, The Heath Ho. | 5·12 | ,, | Corofin ..... | 4·90 |
| ,, | Bickenhill Vicarage ... | 3·48 | XXI. | Kilkenny, Butler House | ... |
| VII. | Melton, Coston ..... | 2·63 | ,, | Carlow, Browne's Hill.. | 3·48 |
| ,, | Horncastle, Bucknall ... | 1·95 | ,, | Kilsallaghan..... | ... |
| VIII. | Walton-on-the-Hill..... | 5·58 | ,, | Navan, Balrath ..... | 2·40 |
| ,, | Broughton-in-Furness .. | 7·17 | ,, | Athlone, Twyford ..... | 3·51 |
| IX. | Wakefield, Stanley Vic. | 3·21 | ,, | Mullingar, Belvedere... | 3·15 |
| ,, | Ripon, Mickley ..... | 4·49 | XXII. | Ballinasloe ..... | 3·09 |
| ,, | Scarborough..... | 2·85 | ,, | Clifden, Kylemore ..... | 7·50 |
| X. | Mickleton..... | 2·68 | ,, | Crossmolina, Enniscoe.. | 3·32 |
| ,, | Haltwhistle, Unthank.. | 5·25 | ,, | Carrick-on-Shannon ... | 1·88 |
| ,, | Shap, Copy Hill ..... | 5·65 | XXIII. | Dowra ..... | 4·20 |
| XI. | Llanfrechfa Grange ..... | 5·26 | ,, | Rockcorry..... | 2·91 |
| ,, | Llandovery ..... | 7·02 | ,, | Warrenpoint ..... | 2·23 |
| ,, | Solva ..... | 5·16 | ,, | Newtownards ..... | 2·40 |
| ,, | Castle Malgwyn ..... | 6·70 | ,, | Carnlough..... | 4·30 |
| ,, | Rhayader, Nantgwillt.. | 9·09 | ,, | Bushmills ..... ..... | 3·98 |
| ,, | Carno, Tybritle ..... | 8·91 | ,, | Buncrana ..... | 4·00 |

## CLEAR NIGHTS.

*To the Editor of the Meteorological Magazine.*

SIR,—Have any of your readers observed, and if so, can they offer any explanation of the entire clearing of the sky that has occurred on so many nights, after dull or wet days, during the late autumn.—I am your obedient Servant, K.

*London, 18th December*, 1880.

# DECEMBER, 1880.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1860–5 | Greatest Fall in 24 hours. Dpth | Date. | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Date. | Min. Deg. | Date. | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches | inches. | in. | | | | | | | | |
| I. | ENGLAND. | Camden Square | 3·17 | + 1·67 | ·53 | 29 | 18 | 56·5 | 10 | 28·2 | 26 | 5 | 11 |
| II. | | Maidstone (Hunton Court) | 2·37 | + 1·25 | ·64 | 19 | 17 | ... | ... | ... | ... | ... | ... |
| ,, | | Strathfield Turgiss | 2·68 | ... | ·54 | 29 | 15 | 54·7 | 10 | 27·0 | 22 | 10 | 15 |
| III. | | Hitchen | 2·45 | + 1·14 | ·34 | 29 | 19 | 52·0 | 22 | 26·0 | 21 | 12 | ... |
| ,, | | Banbury | 3·02 | + 1·35 | ·50 | 22 | 20 | 54·8 | 10 | 25·0 | 22† | 14 | ... |
| IV. | | Bury St. Edmunds (Culford) | 2·92 | + 1·43 | ·51 | 27 | 18 | 54·0 | 10 | 23·0 | 2 | 9 | ... |
| ,, | | Norwich (Cossey) | 2·32 | + ·86 | ·43 | 30 | 21 | 54·5 | 10 | 28·0 | 3‡ | 11 | 11 |
| V. | | Bridport | 4·22 | + ·85 | ·94 | 19 | 17 | ... | ... | ... | ... | ... | ... |
| ,, | | Barnstaple | 7·27 | + 4·15 | 1·24 | 14 | 21 | 55·0 | 23* | 33·0 | 2, 18 | ... | ... |
| ,, | | Bodmin | 6·35 | + 1·11 | 1·12 | 19 | 24 | 55·0 | 5 | 31·0 | 26 | 3 | 4 |
| VI. | | Cirencester | 3·73 | + 1·44 | ·47 | 19* | 16 | ... | ... | ... | ... | ... | ... |
| ,, | | Shifnal (Haughton Hall) | 3·58 | + 1·90 | ·57 | 29 | 21 | 53·0 | 9 | 23·0 | 22 | 14 | 14 |
| ,, | | Tenbury (Orleton) | 3·45 | + ·99 | ·63 | 29 | 19 | 56·0 | 4 | 24·5 | 26 | 14 | 17 |
| VII. | | Leicester (Town Museum) | 3·22 | ... | ·37 | 26 | 23 | 54·3 | 6 | 25·5 | 3 | 9 | 23 |
| ,, | | Boston | 2·23 | + ·74 | ·52 | 14 | 16 | 54·0 | 6 | 29·0 | 27 | 10 | ... |
| ,, | | Grimsby (Killingholme) | 2·95 | ... | ·53 | 22 | 20 | 55·0 | 10 | 28·0 | 27 | 7 | ... |
| ,, | | Mansfield | 3·16 | ... | ·70 | 29 | 18 | 54·5 | 6 | 25·2 | 17 | 15 | 17 |
| VIII. | | Manchester (Ardwick) | 5·29 | + 3·13 | 1·04 | 24 | 25 | 54·0 | 1, 6 | 23·0 | 28 | 13 | ... |
| IX. | | York | 3·72 | + 1·92 | 1·52 | 29 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) | 8·96 | + 4·41 | 1·95 | 22 | 26 | 57·0 | 6 | 22·0 | 22§ | 13 | ... |
| X. | | North Shields | 3·82 | + 1·62 | 1·07 | 29 | 19 | 55·2 | 6 | 24·5 | 18 | 11 | 13 |
| ,, | | Borrowdale (Seathwaite) | 15·22 | — 1·73 | 2·20 | 22 | 27 | ... | ... | ... | ... | .. | ... |
| XI. | WALES. | Cardiff | 6·70 | ... | 1·09 | 14 | 20 | 53·8 | 9 | 28·0 | 26 | 4 | ... |
| ,, | | Haverfordwest | 5·94 | + 1·11 | 1·17 | 14 | 18 | 53·0 | 10 | 22·0 | 17 | 7 | 9 |
| ,, | | Aberdovey | 6·39 | ... | 1·08 | 23 | 20 | ... | ... | ... | ... | ... | ... |
| ,, | | Llandudno | 5·40 | + 3·20 | 1·00 | 29 | 20 | 54·4 | 7 | 29·2 | 18 | 2 | ... |
| XII. | | Cargen | 2·58 | ... | ·76 | 22 | 16 | 54·0 | 6 | 18·4 | 31 | 11 | ... |
| ,, | | Hawick (Silverbut Hall) | 3·20 | ... | ·65 | 22 | 21 | ... | ... | ... | ... | ... | ... |
| XIV. | | Douglas Castle (Newmains) | 5·77 | ... | 1·04 | 22 | 28 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Long (Arddaroch) | 8·01 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Kilmory | 8·31 | ... | 1·84 | 18 | 23 | ... | ... | ... | ... | ... | ... |
| ,, | | Mull (Quinish) | 5·43 | ... | ·90 | 18 | 30 | ... | ... | ... | ... | ... | ... |
| ,, | | Loch Leven | 2·80 | — ·92 | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| XVII. | SCOTLAND. | Arbroath | 1·66 | — 1·08 | ·38 | 22 | 9 | 55·0 | 6 | 21·0 | 17 | 13 | ... |
| ,, | | Braemar | 2·18 | — 1·59 | ·32 | 11 | 20 | 53·2 | 6 | —2·0 | 27 | 22 | 30 |
| XVIII | | Aberdeen | 4·41 | ... | ·79 | 24 | 25 | 55·0 | 6, 11 | 14·0 | 27 | 17 | ... |
| ,, | | Portree | 7·38 | — 8·25 | ·92 | 8 | 28 | ... | ... | ... | ... | ... | ... |
| ,, | | Inverness (Culloden) | 2·00 | — ·07 | ... | ... | .. | 54·3 | 5 | 17·5 | 28 | 16 | 24 |
| XIX. | | Dunrobin | 4·25 | + 1·85 | 1·01 | 23 | 18 | 55·8 | 6 | 18·0 | 28 | 18 | ... |
| ,, | | Sandwick | 4·54 | + ·57 | ·83 | 25 | 22 | 52·2 | 7 | 20·3 | 29 | 15 | 17 |
| XX. | IRELAND. | Cork (Blackrock) | 3·41 | ... | ·69 | 27 | 19 | 57·0 | 9 | 25·0 | 17 | 12 | ... |
| ,, | | Darrynane Abbey | 3·99 | ... | ·50 | 20 | 30 | ... | ... | ... | ... | ... | ... |
| ,, | | Waterford | 2·87 | — 1·55 | ·63 | 14 | 20 | 55·2 | 9 | 26·0 | 25 | 9 | ... |
| ,, | | Killaloe | 5·23 | + 1·74 | ·94 | 14 | 23 | 55·0 | 9 | 21·0 | 30 | 10 | ... |
| XXI. | | Portarlington | 3·24 | + ·05 | ·67 | 14 | 22 | 54·0 | 5 | 25·0 | 29 | 15 | ... |
| ,, | | Monkstown | 3·16 | + ·54 | ·71 | 14 | 17 | ... | ... | ... | ... | ... | ... |
| XXII. | | Galway | 3·79 | ... | 1·06 | 21 | 21 | 55·0 | 6 | 25·0 | 26‖ | 8 | ... |
| XXIII | | Waringstown | 4·05 | ... | 1·20 | 22 | 23 | 55·0 | 5 | 20·0 | 26 | 15 | 18 |
| ,, | | Londonderry | 3·87 | ... | ·63 | 22 | 26 | 54·0 | 5 | 23·0 | 28 | 7 | 15 |
| ,, | | Edenfel (Omagh) | 3·37 | ... | ·67 | 22 | 23 | 54·0 | 5 | 18·0 | 26 | 18 | ... |

* And 29. † And 26. ‡ And 17, 18, 22. § And 17. ‖ And 30.
+ Shows that the fall was above the average; — that it was below it.

# METEOROLOGICAL NOTES ON DECEMBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—Brimstone butterfly flying on 4th; robin's nest with five eggs in it seen on 8th; nettle tortoiseshell fiying on 12th; first primrose gathered on 19th; vinca minor gathered on 23rd.

HITCHEN.—Extraordinary changes of temp. throughout the month, five separate times a range of more than 20° in 24 hours; unusually high max., 52° on 22nd. Everything out of season; primroses in blossom, and thrushes and blackbirds in full song. S on five days.

BANBURY.—S on five days; high wind on three days; fog on 8 days.

CULFORD.—Temp. throughout the month very changeable and trying; S on four days. Frost and S at the end of the month.

BODMIN.—A remarkably mild December; mean temp., 47°.

CIRENCESTER.—A few sharp frosts, but, on the whole, mild. Wind principally S.W. and N.W.

ORLETON.—Great fluctuations in pressure and temperature. Frost on the first three days, then warm, dry, and pleasant till the 13th. The remainder of the month was generally cold, with heavy falls of R and S, and only three dry days. About 4 inches of S on the ground on 27th; on 29th a heavy fall of R, which produced a greater flood in the river Teme on the 30th than that of November. Mean temp. of the month about 2°·5 above the average.

LEICESTER.—Sky unusually red at sunset on 9th, extending about 20° above the horizon; much fog, and a good deal of S. Lunar halo on 19th. Gale during the night of 30th.

KILLINGHOLME.—A fine winter month, the former part especially so, the latter part very wet, causing great floods in many places. No really severe weather; the growing wheat looks well, and roses and other garden trees are budding as in spring.

MANSFIELD.—S on seven days; frequent frosts, but none severe.

NORTH SHIELDS.—S on eight days.

SEATHWAITE.—S on nine days. Storms frequent at the beginning of the month.

## WALES.

HAVERFORDWEST.—The first half of the month was mild and damp, the second half wet, heavy falls being frequent, more especially at night. Frosts at night from 16th to 30th, occasionally very sharp. Precelly range three times covered with S.

LLANDUDNO.—A mild, dull and wet month; mean temp. more than 4° above the average.

## SCOTLAND.

CARGEN.—Mean temp. of month 39°·7, 0°·9 above the average.

HAWICK.—A remarkably beautiful sunset on the 9th, and on the night of the 13th a singularly beautiful lunar halo, and later on an exceedingly bright meteor to E. Terrible storm of S and wind on the 19th. No berries on holly or hawthorn, but an abundance of hips. S on ten days.

NEWMAINS.—S on ten days; total depth about 12 inches.

BRAEMAR.—Min. temp. on the 27th, —2°, the lowest registered since Dec. 25th, 1860. Lunar halo on 7th.

ABERDEEN.—South-westerly to westerly winds prevailed till the 10th, when a north-westerly course set in, lowering the temp. considerably, and continued to the close of the month, the weather being squally, with R, S, and H. Mist and haze were frequent; aurora was seen on three nights, and vivid L on Christmas night.

PORTREE.—A very stormy month; heavy S from the 14th to the 31st, with intense frost; a thaw commenced on the evening of the 31st, and by the morning the low ground was free from S.

CULLODEN.—Weather during the month severe, long continued frost and S; low temperatures recorded on the nights of 15th to 18th, 22nd, and 25th to 31st.

SANDWICK.—The month was very cold, wet, and stormy; mean temp. 3°·3 below the average of 53 years. The storms were frequent and severe, and I do not think my anemometer has ever before recorded so many miles of wind in a week as it did from the 8th to the 14th; on the 11th 12th and 14th there were upwards of 1,100 miles, each day and on the 12th there were 1,382 miles. There were gales also on 18th and 25th of from 50 to 55 miles an hour, but on the 12th it was as high as 67 miles, and on the 10th 68 miles an hour. There was some frost and S from 13th to 23rd, and on 24th a S storm began which blocked up the roads, not only here but through Scotland; on the last night of the year, however, the wind changed to W. and a thaw set in, which cleared the plains of S in two days. Auroræ on 26th, 27th, and 28th.

## IRELAND.

DARRYNANE.—Very variable, but, on the whole, mild; a marked contrast to the two preceding Decembers. Cella Æthiopica in flower in the open air on 24th.

KILLALOE.—Fair average weather for the season. Some S from 18th to 27th, but lying only on the higher grounds. Frost on ten nights, but not of great intensity. Mean temp. above the average.

LONDONDERRY.—Some frost and S at intervals during the month; wind variable.

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# THE WEATHER IN DECEMBER.

CLOUDY or gloomy, but very mild, weather was general in our Islands during the first week.

The depression which was off the N. coast of Scotland at the close of November passed quickly E. ward in the course of the 1st and following night until, at 8 a.m. on 2nd, it was over S. Sweden. In its rear the bar. rose quickly; and an anticyclone was formed over England and France. Next day pressure decreased briskly over our Islands; but continued increasing in France and S.E. England: hence the anticyclone was now limited to France and the English S. and S.E. coasts. On the day following, however, the bar. rose generally in W. Europe; while in N. Scandinavia a slight fall took place: pressure became still higher (30·5) in France; and another anticyclone seemed to be developing over Sweden: in N. Norway and N. Scotland pressure was comparatively low. A rather brisk decrease of pressure occurred in N. Scandinavia on the 5th, a large but shallow depression being off the Norwegian coast, whilst in nearly all other parts of W. Europe the mercury rose. Readings now ranged from 30·6 in. over France to 29·6 in. in N. Norway. A decrease of pressure on the 6th caused the anticyclone to change its position from central France to S. England, the Channel, and N. France. Over N. Scandinavia a somewhat deep depression was shown.

Temp. was more than the average in all districts, the excess being 5° in S. Ireland and E. Scotland. The max. were generally high, ranging in most districts between 53° and 57°. The min. occurred generally on the 2nd and 3rd, when at Manchester the ther. indicated 23°, and 25° at Cambridge and Markree Castle.

Rainfall was slightly above the mean in Scotland; but considerably less in most English and Irish districts. Heaviest fall, 1·49 in., at Loch Sunart; lightest, 0·01 in., at Hereford and Oxford.

Bright sunshine was of extremely short duration throughout our Islands. Max. duration, 15 hours, at Kelstern and Cambridge; min., 2, at Pembroke.

The next week (7th–13th) was very dull, but mild and dry, everywhere. Towards the end of the period the weather became much less settled, and a little rain fell at all stations, except Bawtry, Southampton, and Plymouth.

In the course of the night (7th–8th) an important disturbance (28·8) advanced to the N. of Norway, occasioning a fall of the bar. amounting to 0·74 in. at Bodo, and a brisk fall over the whole of Scandinavia and the N. of the British

Islands. The anticyclone kept much the same position ; and pressure at the centre (30·7 in.) was higher than ever. In France, the greater part of England, and some places in Ireland, the bar. showed an inclination to rise. On the following day a rise of the mercury began in nearly all parts of our Islands, France and W. Norway, whilst in Sweden the bar. still fell ; a large area of low pressure was shown over Sweden and Norway, whilst the area of high readings, owing to the spreading in a S.W. direction of the area of low pressure, moved W.-ward, being, at 8 a.m. on 9th, over the Bay of Biscay. During the night (9th–10th) another rather deep depression travelled from W. to E. to the W. coast of Norway, producing a brisk decrease of pressure over the whole of W. Europe. The area of high pressure was now over our S.W. coasts. The depression over Scandinavia soon moved away ; but on the day following another disturbance appeared off our N.W. coast : the bar. rose over Scandinavia and Denmark, and at some English stations, whilst in all other parts of W. Europe it fell. At 8 a.m. on 12th the depression had its centre (28·8 in.) near Christiansünd : in consequence, the bar. fell rapidly in Scandinavia, the change amounting to 0·67 in. at Christiansünd. The aria of highest readings (centre now decreased to 30·4 in.) was still shown over our S.W. coasts and the Bay of Biscay. There was no change in the general distribution of pressure during the next 24 hours. On the morning of the 13th the centre of the last-mentioned depression was over S. Sweden and part of Denmark ; and a fresh disturbance seemed to be approaching our S.W. coasts : hence while pressure increased over the N. half of our Islands, it decreased everywhere else. Readings were still highest over the Bay of Biscay.

Temp. continued to be above the average throughout our Islands, the excess being for the most part 5° or 6°. The absolute max. (58°) was recorded at Manchester and Marlborough. The lowest of the min. were, with two exceptions, registered on the 11th.

Rainfall less than the mean everywhere. Heaviest fall : 2·27 in. at Loch Sunart ; lightest : 0·01 in. at Hereford and St. Leonards.

The seven days following (14th–20th) were very dull and unsettled generally. Great quantities of snow fell in Scotland, and exceedingly heavy rain in S. and S.W. England.

The depresssion noticed as being over Denmark on 13th passed away in the course of the day, and the mercury rose quickly in Scandinavia and Denmark, whilst over our Islands and France the bar. fell rapidly. The weather became very unsettled in the course of the next 24 hours, owing to the passage across W. Europe of two disturbances, one being, at 8 a.m. on 16th, over S. Wales, the other over the North Sea between the English N.E. coast and the W. coast of Denmark. The bar. fell everywhere, except in Scotland, where it rose quickly. During the day following the depression over the North Sea disappeared over N. Germany, whilst that over S. Wales moved to the N.W. of France : the bar. consequently rose in nearly all parts of W. Europe. On the next day the distribution of pressure underwent a peculiar and sudden change. Over France and Scandinavia the mercury rose, whilst the area of high pressure, which was over the more N. parts of our Islands, gave way, and was succeeded by a deep depression that advanced to our N.W. coasts, causing the bar. to fall 0·77 in. over N. Ireland. By 8 a.m. on 19th the centre (28·6 in.) was between Stornoway and Aberdeen. In consequence, the bar. fell quickly over the North Sea and Scotland ; but continued to rise briskly over Sweden and France. The chart of the 20th showed the centre to be over S. Norway, so that the bar. now fell in Sweden as well as in Norway : in the rear of the depression pressure began fast to recover, whilst over France and S. England the bar. fell somewhat, this latter decrease being caused by a number of small disturbances over the English Channel. These depressions soon moved away, and then the bar. rose over the whole of W. Europe.

Temp. rather more than the average in S. and S.W. England ; but in all other districts readings were much lower : in Scotland the deficit ranged from 6° to 8°. The ther. was mostly lowest on the 17th, when it fell to 15° at Glenalmond, 16° at Glasgow, 19° at Shrewsbury, 20° at Markree Castle and

Durham, and to between 23° and 30° elsewhere, except in the S. and S.W. The max. were generally rather low, the highest reading registered being 55° at Valentia.

Rainfall less than the mean in all districts, save E. and N.E. England: in S. and S.W. England the excess was very large, amounting to 2·77 in. at Falmouth, and 2·44 at St. Leonards. Lightest fall: 0·25 in. at Spurn Head.

Bright sunshine was more plentiful, except over central, E. and S. England, where the number of hours recorded was very small indeed. Max. duration: 18 hours at Douglas, Armagh and Dublin; min. duration: 1 hour at Falmouth.

The weather during the succeeding week (21st–27th) was generally dull and unsettled, with heavy falls of snow in Scotland, much rain, and some snow or sleet over England and Ireland. On the 25th the sky was comparatively clear, and continued so in S.E. England on 26th.

A depression, which was advancing towards our W. coasts on the 22nd, suddenly changed its course, having its centre on the morning of the 23rd over the Hebrides: from this point it passed E. ward suddenly during the night (23rd–24th) until on the following morning it was over the North Sea between Scotland and Denmark: the bar. consequently fell quickly over the whole of France, all our more S., E. and N. districts, and on the E. shores of the North Sea; but on our W. coast a brisk recovery of pressure began. The centre of the disturbance was shown over Denmark on the chart of the 25th, and near Stockholm on that of the 26th. In the course of the night (26–27th) a small depression (29·2) advanced from the Atlantic to S. Wales, occasioning a fall of 0·54 inch at Pembroke, and a brisk fall in most parts of our Islands. In all other parts of W. Europe pressure increased.

Temp. was about the average in S. and S.W. England; below it in all other districts: in E. Scotland the deficit was as much as 8°, and in N. Ireland 6°. The max. took place generally on the 23rd, the ther. rising to 54° or 55° over the greater part of England and S. Ireland. The min. occurred on 27th, when a reading of 14° was recorded at Aberdeen, and 23° or 24° over the greater part of England and Ireland. The absolute min. was 10° at Wick.

Rainfall much more than the mean everywhere, the excess being very large in the western parts of England. Heaviest fall: 3·33 in. at Manchester; lightest fall: 0·73 in. at Strathfield Turgiss and Silloth.

Bright sunshine showed an increase in most places. Max. duration: 21 hours at Durham; min. duration: 2 hours at Falmouth.

The 28th and two following days were generally dull and unsettled: the 31st was, however, moderately fine. Temp. was about the average, except in E. Scotland and in Ireland, where it was 3° or 4° below it. Rainfall was below the average, except in N. and S.W. England, where there was an excess. Bright sunshine was very deficient everywhere.

On the 28th a small, but well-marked, depression (29·2 in.) advanced to the extreme S.W. of England, causing a brisk decrease of pressure in the S.W., and a fall over all W. Europe. During the 29th and night following, this disturbance travelled N.E. ward to the neighbourhood of Skudesnäes, at the same time growing much deeper, the reading at the centre now being 28·8 in. Over England a shallow subsidiary was shewn. During the night (30th–31st) the main disturbance passed on in a N.E. direction towards central Scandinavia, whilst the subsidiary travelled away E. ward to N. Germany. The bar. then began to rise over the whole of W. Europe—briskly so in Scandinavia, France, and S.W. England.

*Lowestoft.* H. E. M.

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END OF VOL XV.